ELECTRICAL REVIEW

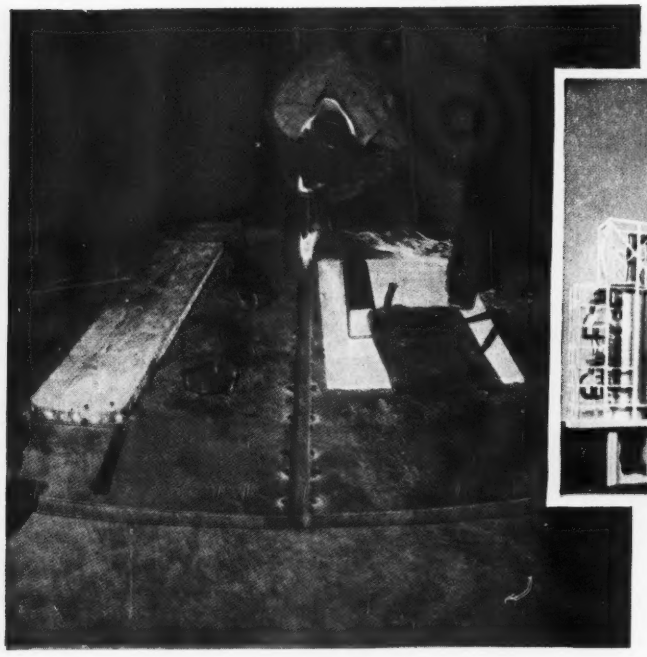
This is the **Mazda** trademark—
symbol of better light

Mazda
lamps stay brighter longer

A.E.I. LAMP & LIGHTING COMPANY LTD
(An A.E.I. Company)
PUBLICITY DEPARTMENT,
18 BEDFORD SQUARE, LONDON, W.C.1

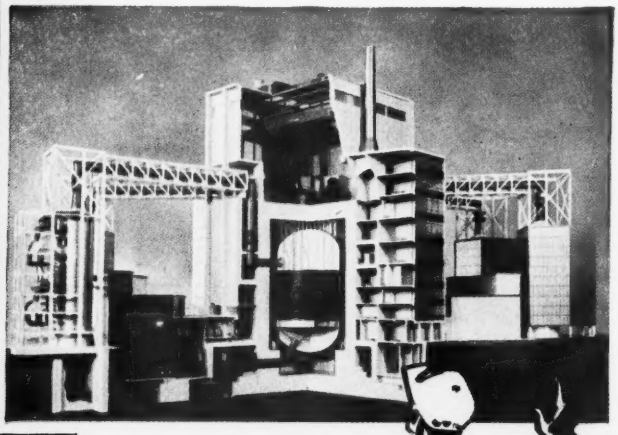
Welding begins inside the bowl of the reactor vessel. Six teams of John Thompson welders work outwards from the centre, welding the 3in. thick steel plates which have been assembled and are temporarily held in position by clamps. Further welding teams began working on the next ring of plates shortly after this photograph was taken. In the background, an X-ray unit stands ready inside the bowl for weld examination.

A welder works from the bottom centre of the reactor vessel, welding together the 3in. thick 'petal' plates which form the lower bowl. Accurate edge preparation of the plates has been achieved by a specially developed flame planing technique in John Thompson's works. The temperature of the weld area is maintained between welding runs by means of flame torches, one of which is seen ready to hand, in front of the welder.



Buttercups at Berkeley...

John Thompson's construction men — familiar in their yellow helmets on power station and industrial sites throughout Britain — are now at work on the Central Electricity Authority's first commercial nuclear power station being built by the A.E.I. — John Thompson Nuclear Energy Company at Berkeley, Gloucestershire. Crisply, the construction programme proceeds to a minutely planned schedule. The bottom dome portion of one of the huge 1,000 ton reactor vessels was transported in sections to the site where it is being welded together to grow simultaneously with the reactor building. The "Buttercups" are speedily getting on with this job in which they are building the reactor vessels, the thermal shielding, the sixteen large heat exchange towers, gas ducting and nuclear fuel loading machines.



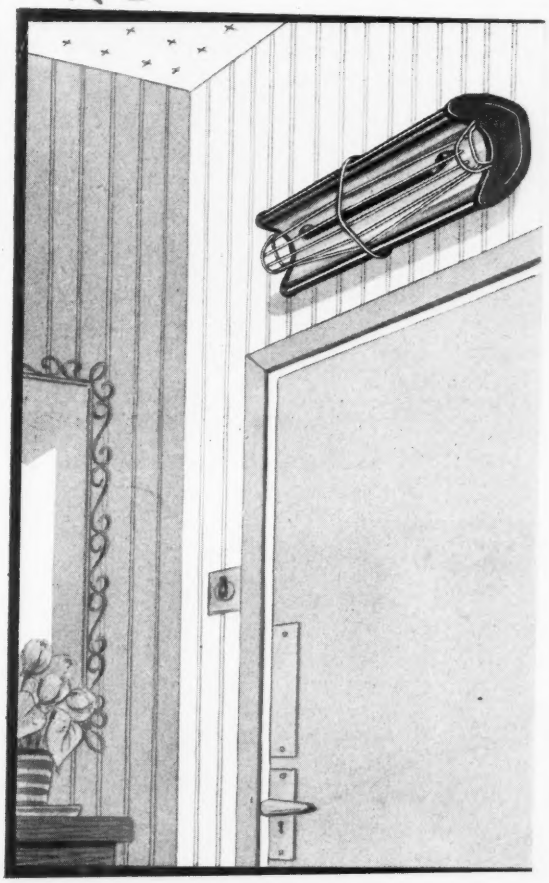
JOHN THOMPSON GROUP

JOHN THOMPSON LIMITED

JOHN THOMPSON WATER TUBE BOILERS LTD · WOLVERHAMPTON

WTA/14

FOR SAFE GENTLE WARMTH . . . .



The NEW

Heatrae 'SAFEROD'

HIGH LEVEL REFLECTING

SAFETY HEATER

FOR WALL MOUNTING

Safety long life metal sheathed element.

Amply dimensioned for cool running and even distribution of warmth.

Full electrical protection. No exposed live parts.

Easy fixing on separate bracket.

Reflector — long wide angle construction for maximum comfort area.

Officially guarded in accordance with B.S.1945 and manufactured to B.S.1670.

Design and workmanship to Heatrae's traditional high standards.

THE IDEAL HEATER FOR BATHROOMS

Reflector made from solid brass finely finished in chromium plate.

Decorative end panels, stoved enamel finish.

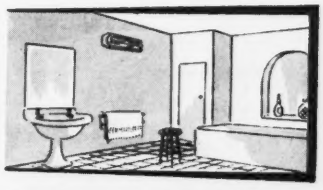
Latest embedded rod-type element.

Sheath manufactured from Inconel, renowned for its ability to withstand high temperatures without deterioration. Tough and rustless.

Safety Guard chromium plated. Non-slip grip for incoming flexible.

Robust terminals for secure connections.

Available for standard voltage ranges — A/C or D/C. Total loading 1000 watts for economical operation. Consumption 1 unit per hour.



NURSERIES

CONSULTING ROOMS ETC.

HEATRAE LIMITED ★ NORWICH ESTABLISHED IN 1920

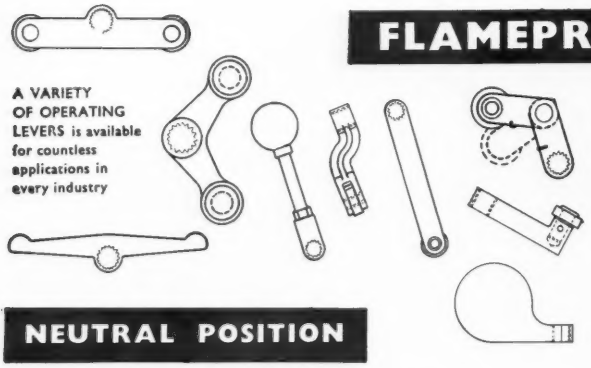
A

limit switch

For all heavy duty limit switch applications, particularly those to withstand conditions of extreme severity, there is a suitable B S A — ACME SNAP-LOCK of either water, oil and dust proof or flameproof versions. The superiority of this switch is due largely to the simplicity but ruggedness of its mechanical and electrical units contained in seperate compartments within a robust housing. Unique Snap-Lock design ensures self-wiping quick make and break, positive contact, maximum resistance to wear, and accurate repetitive tripping.

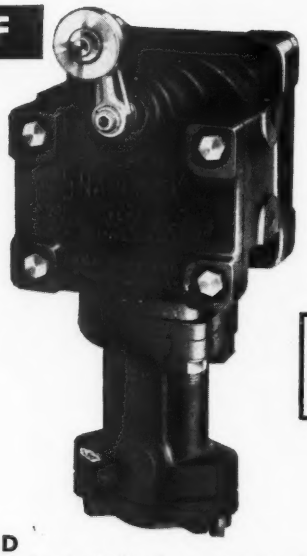
WATER, OIL & DUST PROOF

STANDARD



A VARIETY OF OPERATING LEVERS is available for countless applications in every industry

FLAMEPROOF



LICENSED **FLP** No. 3574 Group I No. 3575 Group II & III

NEUTRAL POSITION

These limit switches are now available in Neutral Position versions. Spring-loaded devices return the operating lever to the central (neutral) position. One or both of the springs are removable for various circuit arrangements. A third spring is supplied for converting to one normally made and one normally broken circuit.

B·S·A ACME snap-lock

MADE UNDER LICENCE FROM NATIONAL ACME CO. U.S.A.

B.S.A. TOOLS LTD. BIRMINGHAM·33·ENGLAND

Sole Agents Gt. Britain

BURTON GRIFFITHS & CO. LTD.

Snap-Lock Division : 93 Albert Embankment, London, S.E. 11

Phone : RELIANCE 3891

Ad. No. 420

STANDARD

Single pole, double break, double throw, operates with either circuit normally open with other closed, or maintaining in either position, or available with central neutral position: return springs removable for various circuit arrangements. Heavy die-cast case. Water, oil and dust proof. Conduit ¾" in. B.S., or No. 3 Admiralty Pattern Cable gland entry. Two screw side mounting or backplate mounting in two styles, or Tandem style (back to back mounting). Operating lever position adjustable in 7·5 deg. increments through 82.5 deg. either way from normal. Levers for a variety of applications.

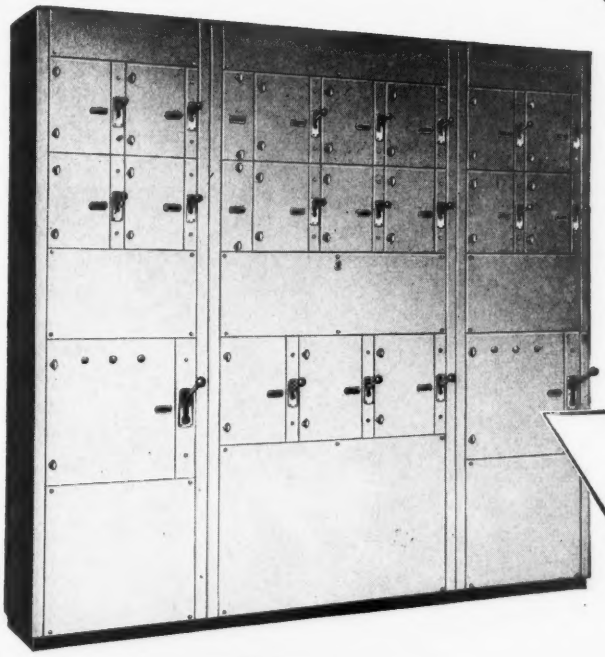
FLAMEPROOF

Buxton certificates No. 3574 (Group I) No. 3575 (Groups II and III gases). Meehanite iron castings. Self wiping solid silver contacts. Interchangeable plugs and sockets. Internal mechanism removable as a unit for servicing. **Single SWA cable entry (standard); double entry if required.** Operating lever position adjustable in 7.5 deg. increments through 360 deg. Levers for a variety of applications. **TYPE HLB**: Single pole, double break, having one normally closed and one normally open circuit — reversible by transferring the return spring. Return spring removable for external manual operation. **TYPE HLB/NP:** Single pole, double break, double throw, with central neutral position. Return springs removable for various circuit arrangements.

You cannot buy better gear

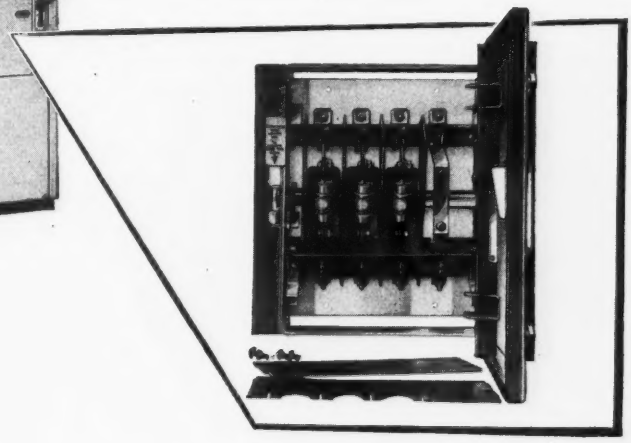
BILL MAJESTIC

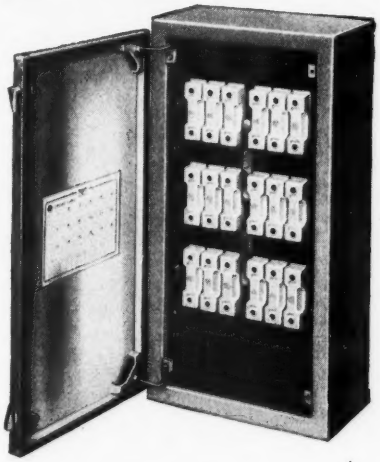
THE NEW LOOK IN SWITCHGEAR



BILL MAJESTIC HEAVY DUTY CUBICLE SWITCHBOARDS

- TOTALLY ENCLOSED, CLEAN MODERN STYLING.
- FLEXIBILITY OF LAY-OUTS TO SUIT SPECIFIC REQUIREMENTS OF CONSULTING ENGINEERS, ARCHITECTS AND CONTRACTORS.
- CAN BE SUPPLIED WITH BUILT-IN FUSEBOARDS AND FLUSH TYPE METERING.
- A RANGE OF FLUSH MOUNTING FUSE-SWITCHES FROM 30 TO 800 AMPERES CAN ALSO BE SUPPLIED AS SEPARATE UNITS.
- FULLY ILLUSTRATED IN PUBLICATION MCP 1057.





BILL MAJESTIC DISTRIBUTION BOARDS

- CLEAN AND ATTRACTIVE MODERN APPEARANCE.
- SIMPLIFIED MAINTENANCE.
- HEAVY DUTY BILL ARC DAMPING OR H.R.C. FUSES.
- FULLY ILLUSTRATED IN PUBLICATION MDB 1057.

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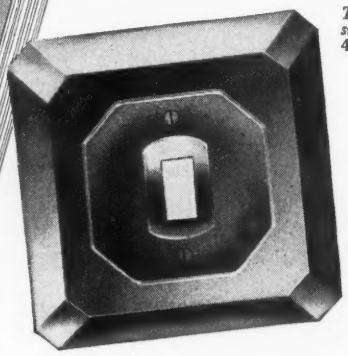
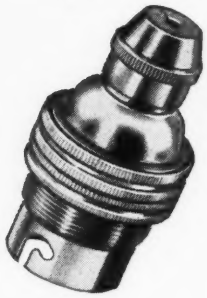
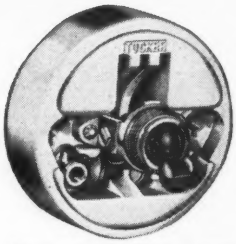


The 'Trent' range of 5 amp flush switches are available in 1, 2, 3 and 4 gang form.

'Trojan' Brass B.C. Lampholder.



'Titan' all-insulated B.C. Lampholder.



Open view of 'Tyne' heavy duty 5 amp tumbler switch.

'Tyne' heavy duty quick make and break tumbler switch.

NOW YOU CAN CHOOSE all the accessories you need from one catalogue—the MEM, Tucker & Kersons catalogue. The merger of these famous accessory manufacturers means that you get a wider range of accessories from one source than ever before. It saves you time and trouble. And you know that every line is backed now by the combined experience of three outstanding names in electrical accessories. Send for your MEM-Tucker-Kerson catalogue today.

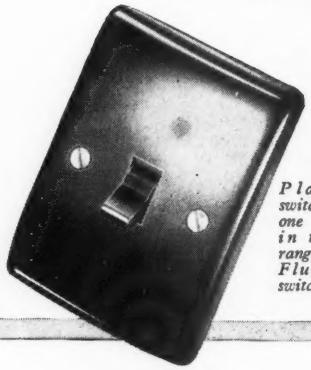
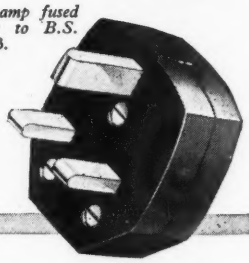


Plate and switch form a one piece unit in the Tay range of A.C. Flush Plate switches.

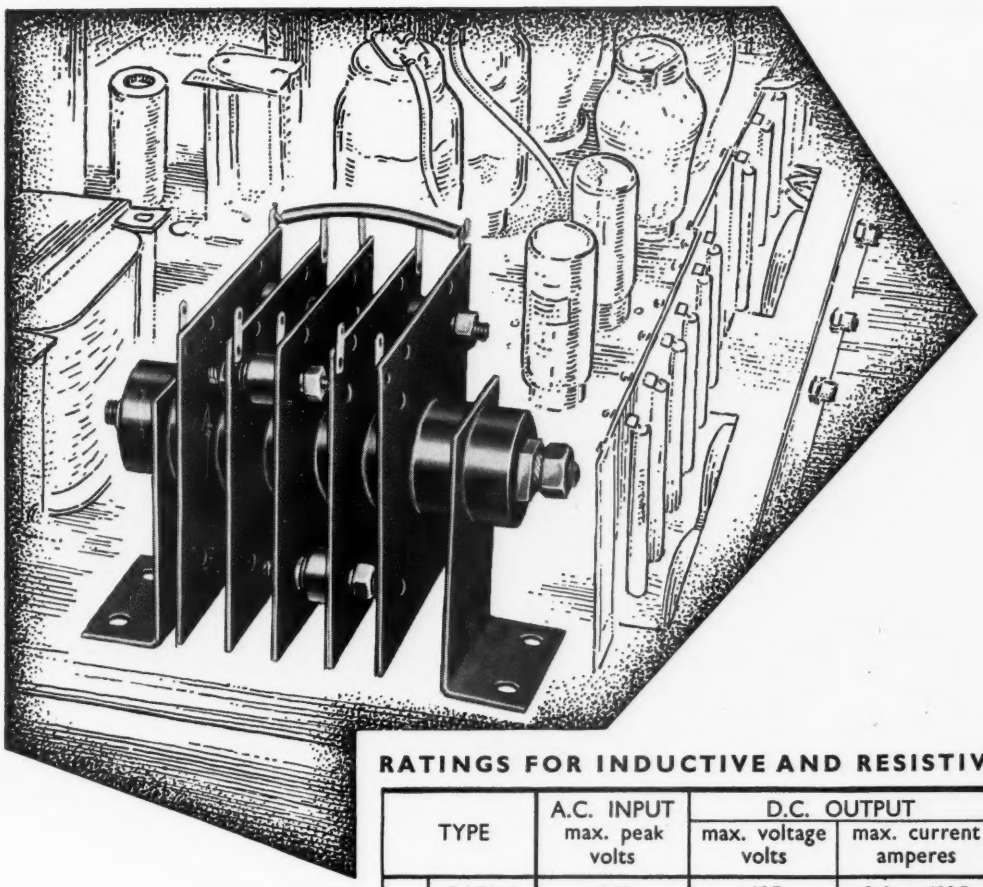
13 amp fused plug to B.S. 1363.



MIDLAND ELECTRIC MANUFACTURING CO., LTD., TYSELEY, BIRMINGHAM, 11

B T-H

GERMANIUM JUNCTION RECTIFIERS
— finned bridge units



The well-known range of BTH germanium junction rectifiers is now available made up into convenient bridge units ready for incorporation in your equipment.

RATINGS FOR INDUCTIVE AND RESISTIVE LOADS

	TYPE	A.C. INPUT max. peak volts	D.C. OUTPUT max. voltage volts	D.C. OUTPUT max. current amperes	OVERALL LENGTH inches
SINGLE-PHASE	GA31-A	140	125	2·0 at 40°C	3½
	GA41-A	53	47	2·0 at 60°C	3½
	GA51-A	210	187	2·0 at 40°C	3½
	GA61-A	106	94	2·0 at 60°C	3½
	GA52-A	340	303	2·0 at 40°C	5
	GA62-A	170	151	2·0 at 60°C	5
	GA53-A	510	455	2·0 at 40°C	6½
	GA63-A	254	227	2·0 at 60°C	6½
THREE-PHASE	GB31-A	140	188	3·0 at 35°C	4⅝
	GB41-A	53	71	3·0 at 55°C	4⅝
	GB51-A	210	283	3·0 at 35°C	4⅝
	GB61-A	106	143	3·0 at 55°C	4⅝
	GB52-A	340	458	3·0 at 35°C	6¾
	GB62-A	170	229	3·0 at 55°C	6¾

BRITISH THOMSON-HOUSTON

THE BRITISH THOMSON-HOUSTON CO., LTD., RUGBY ENGLAND

an A.E.I. Company

A5184

safety first

with SIEMENS EDISWAN **earth leakage circuit breakers**

Three types of earth leakage circuit breakers make up the Siemens Ediswan range of these established safety switches. Voltage operated and complying with B.S. requirements, they are of improved design and ensure a wide margin of safety. Tripping mechanism is simple and robust; cases and covers give good protection against heat, cold, damp, dust and insects. For full details, please ask for catalogue Z174/57.

Types TP and TP & N Circuit Breakers

A new addition to the range intended for industrial use; suitable for 60 amp. 500v. circuit. Available with or without overload coils on each phase, and with or without neutral link. Extended terminal covers, fitted with rubber gaskets, can be supplied for use with T.R.S. cable or conduit.

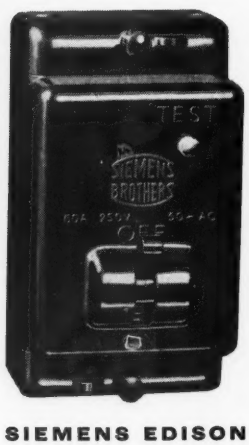
'Safetrip' Type EL15 Switch Socket

Suitable for 13/15 amp. 250v. circuit; complete earth leakage protection for domestic apparatus using up to 3 kw. Available also as switch only.

Pamphlet No. ST.2 gives details of Siemens Ediswan Monitored Earth Leakage Circuit Breaker Units for automatic switching off should the earth wires become disconnected or fractured.

Type ET.60D Circuit Breaker

Suitable for 60 amp. 250v. circuit; for use as consumers' main switch in small dwellings, especially in rural areas, and for protection of farm equipment or industrial tools. Overload protection can be supplied, and extended terminal covers, fitted with rubber gaskets, are available for use with T.R.S. cable or conduit.



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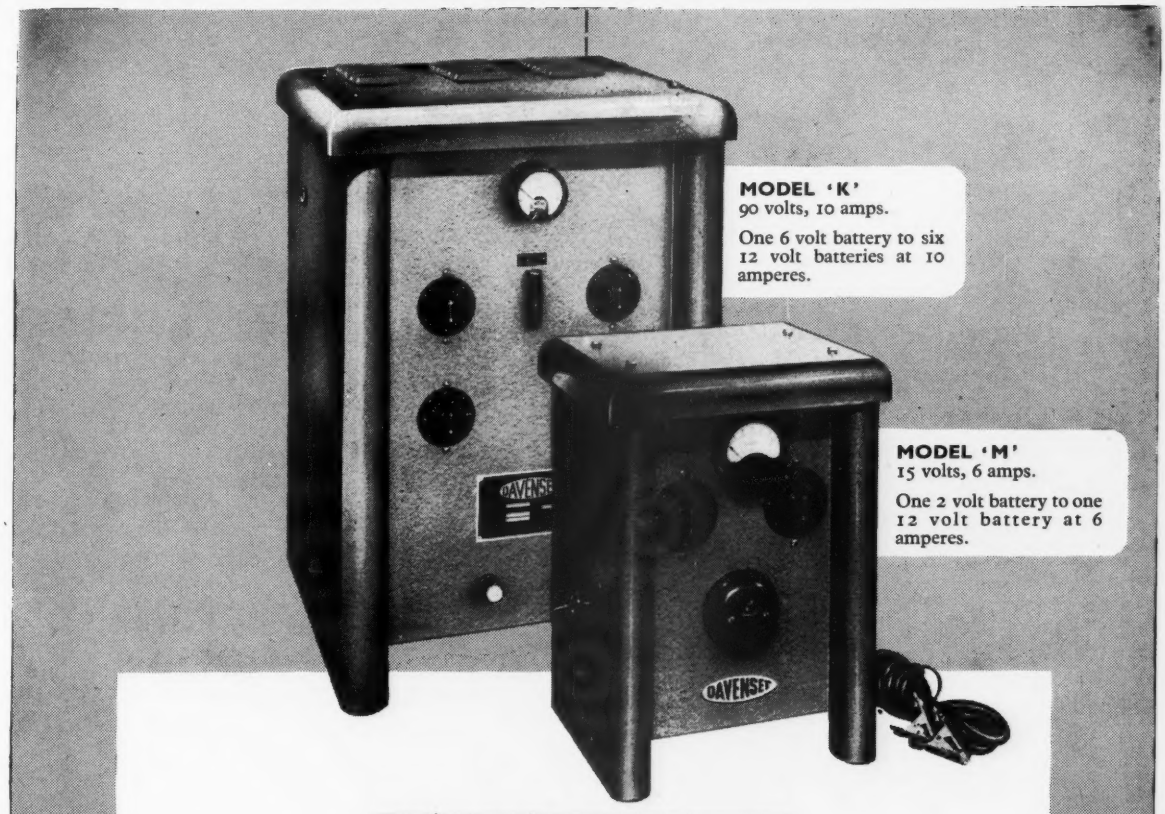


MODEL 'K'
90 volts, 10 amps.

One 6 volt battery to six 12 volt batteries at 10 amperes.

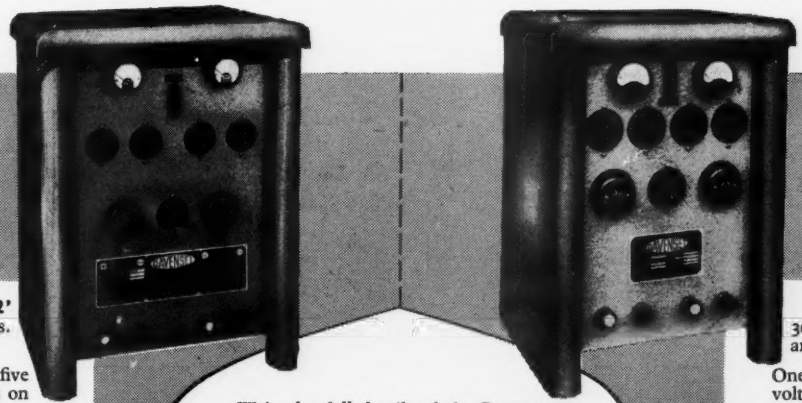
MODEL 'M'
15 volts, 6 amps.

One 2 volt battery to one 12 volt battery at 6 amperes.

DAVENSET

Commercial Chargers of all types

PARTRIDGE WILSON & CO. LTD.
DAVENSET ELECTRICAL WORKS, LEICESTER



MODEL 'DSC2'
75 volts, 6 amps. and 10 amps.

One 6 volt to five 12 volt batteries on each circuit.

MODEL 'T'
30 volts, 3 amps. and 6 amps.

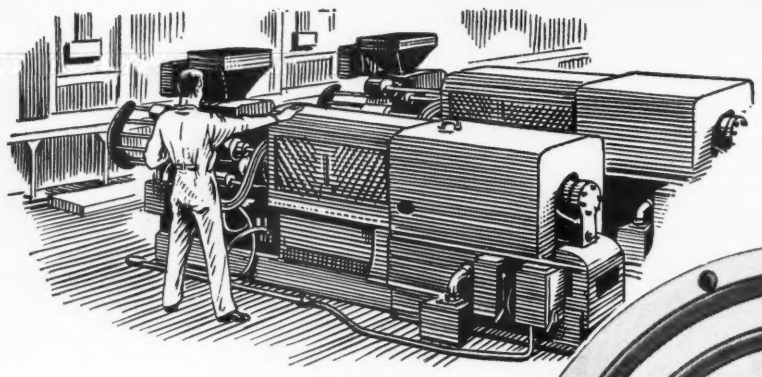
One 6 volt to two 12 volt batteries on each circuit.

Write for full details of the Davenset range of Battery chargers and engine starters suitable for 200/250 volt AC mains.

Designed from first to last

Backer elements

. . . for the PLASTICS INDUSTRY



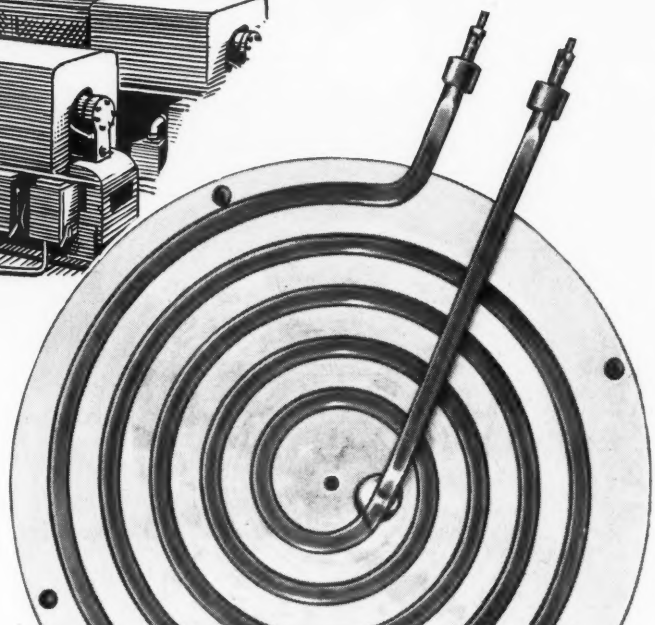


Illustration shows a Groove Embedded Platen Heater. Rating 3000w. Voltage 240. Sheath Material: — Inconel.

Concentrated Heat where you want it!

Heat — Safe heat — exactly where required is demanded by most modern industries to-day. Our whole business is to design and provide electric heating elements exactly "tailored" to the specific needs of your process. Let us help you to solve your particular problem — Ask one of our technical Representatives to call and discuss it.

BACKER ELECTRIC COMPANY LIMITED
ROTHERHAM YORKS

MYTEMIN

the ABSOLUTELY SAFE ELECTRIC CHAIN PULLEY BLOCK

- *Automatic, self-adjusting, disc-type Load Brake for double safety and accurate hook positioning.*
- *Cord or pendent push-button control.*
- *High Carbon Steel Calibrated Load Chain for absolutely safe flexibility. It is proof tested to twice safe working load.*
- *Patent Automatic Load Chain Guards and Limit Switches for complete protection against mishandling.*
- *Reversing T.P. Controller operated by pendent control from hoist, or remote control. Designed for heavy duty.*
- *All gears and shafts splined for strength and heavy duty bearings throughout.*
- *High torque motor totally enclosed.*
- *Precision ground alloy steel gears totally enclosed in oil bath gear box.*
- *Robust steel mainframe sustaining direct load.*

CREEP-SPEED MODELS AVAILABLE

WRITE FOR BOOKLET P.B.7

Automatic Load Brake and independent Motor Brake provide double safeguard and accurate positioning of work.

5 MODELS—

CAPACITIES 400 LBS. (lifting speed 37½ ft. per min.) TO 3,600 LBS. (lifting speed 8¼ ft. per min.). Alternative steel hook or trolley suspension.

PRICES FROM £73

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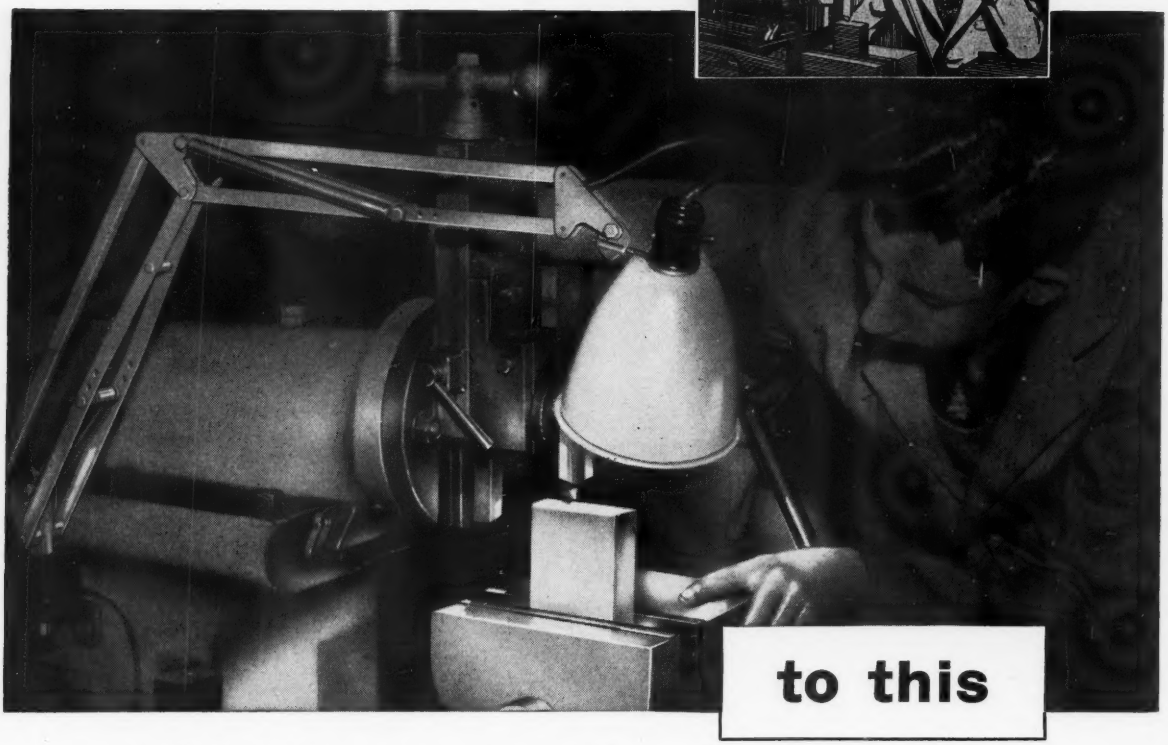
REGISTERED TRADE MARK

ELECTRIC PULLEY BLOCKS CRANES • CONVEYORS

OUR REPRESENTATIVE WILL CALL ON YOU —ANYWHERE IN THE WORLD

GEO. W. KING LTD., ARGYLE WORKS, STEVENAGE, HERTS.
TELEPHONE: STEVENAGE 440

Switch from this



to this

and step up production . . .

For working within close limits, an Anglepoise is simply indispensable. However good a worker and his eyes may be, he must see the job. This applies in all fine work, drilling, assembling, etc., where instantly adjustable close-to-the-job lighting is a sheer necessity.

Anglepoise throws a clear, concentrated light right on and into the work, not in the operator's eyes, follows the job from any position or angle, degree by degree, at a finger-touch and 'stays put' in any required position—and out of the way when not needed. It needs only a low-powered bulb for high-class results—a big saving on the lighting bill (it can be supplied with a small shade for low voltage systems). Why not learn more about this fine lamp by sending for Booklet ER?

TERRY Anglepoise LAMP

Regd.

Sole Makers: HERBERT TERRY & SONS LTD · REDDITCH · WORCESTERSHIRE

*** A SUGGESTION FOR MACHINE MANUFACTURERS:–**

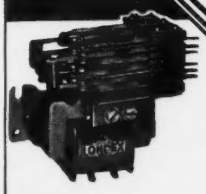
Why not fit your products with Anglepoise? We will submit samples on approval.

Some of the alternative bases for all models

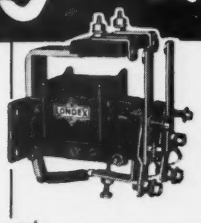
HT30

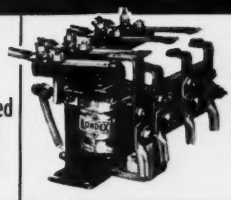
LONDEX

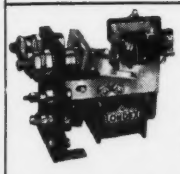
Range of Relays

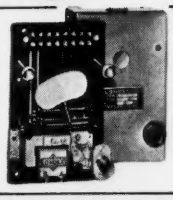

Multiple Contact Type LF

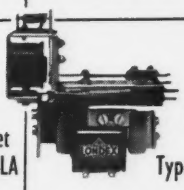
Mercury Switch Type LQA

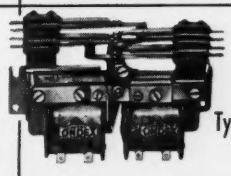

High Speed Contactor Type BB

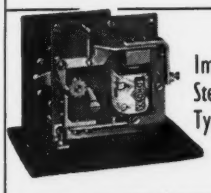

General Purpose Contactor Type LB

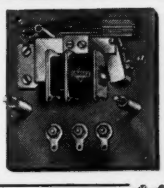

Heavy Current Contactor Type LF/STR

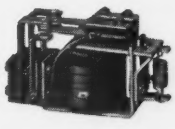

Latch-in with hand reset Type LF/LA

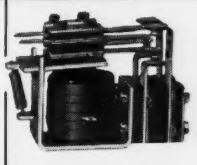

Latch-in with electric reset Type LF/ML/ERS

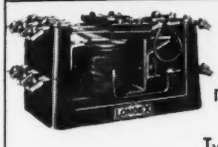

Double Action Types LF/D LQA/D

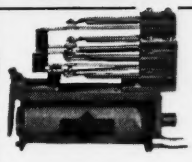

Impulse Stepping Type FS/HD

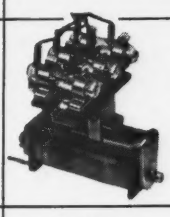

Battery Cut-out Type LF/C


Midget for A.C


Midget for D.C.


Midget with moulded base Type MOL

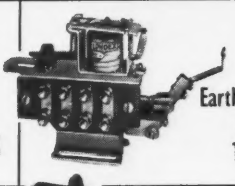

Sensitive P.O. Type for D.C. Type KR

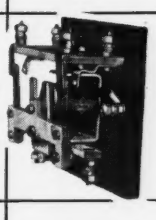

Sensitive Mercury Switch for D.C. Type KR/QA

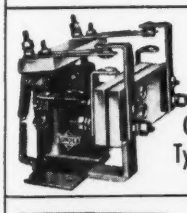
Miniature D.C 24v. Max. Coil Type ST

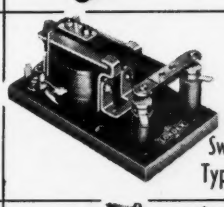
Co-axial Relay Type SCX

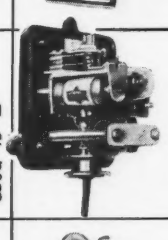
Co-axial Relay (Sealed) Type GCX

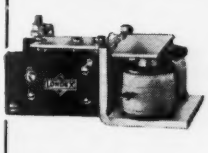

Aerial Earthing for Aircraft Type 411

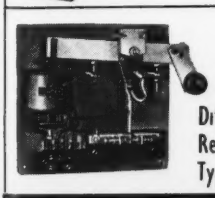

Aerial Change-over Type AECO.4

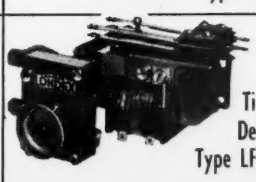

Aerial Change-over Type AECO.15


High Voltage Switching Type 9648

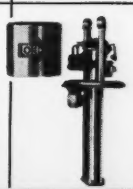

Electronic Amplified Relay Type CCR


Sensitive Relay Type SSR


Differential Relay Type HS


Time Delay Type LF/T1

Time Delay Type LQA/T3


D.C. Bus-bar Relay Type XK

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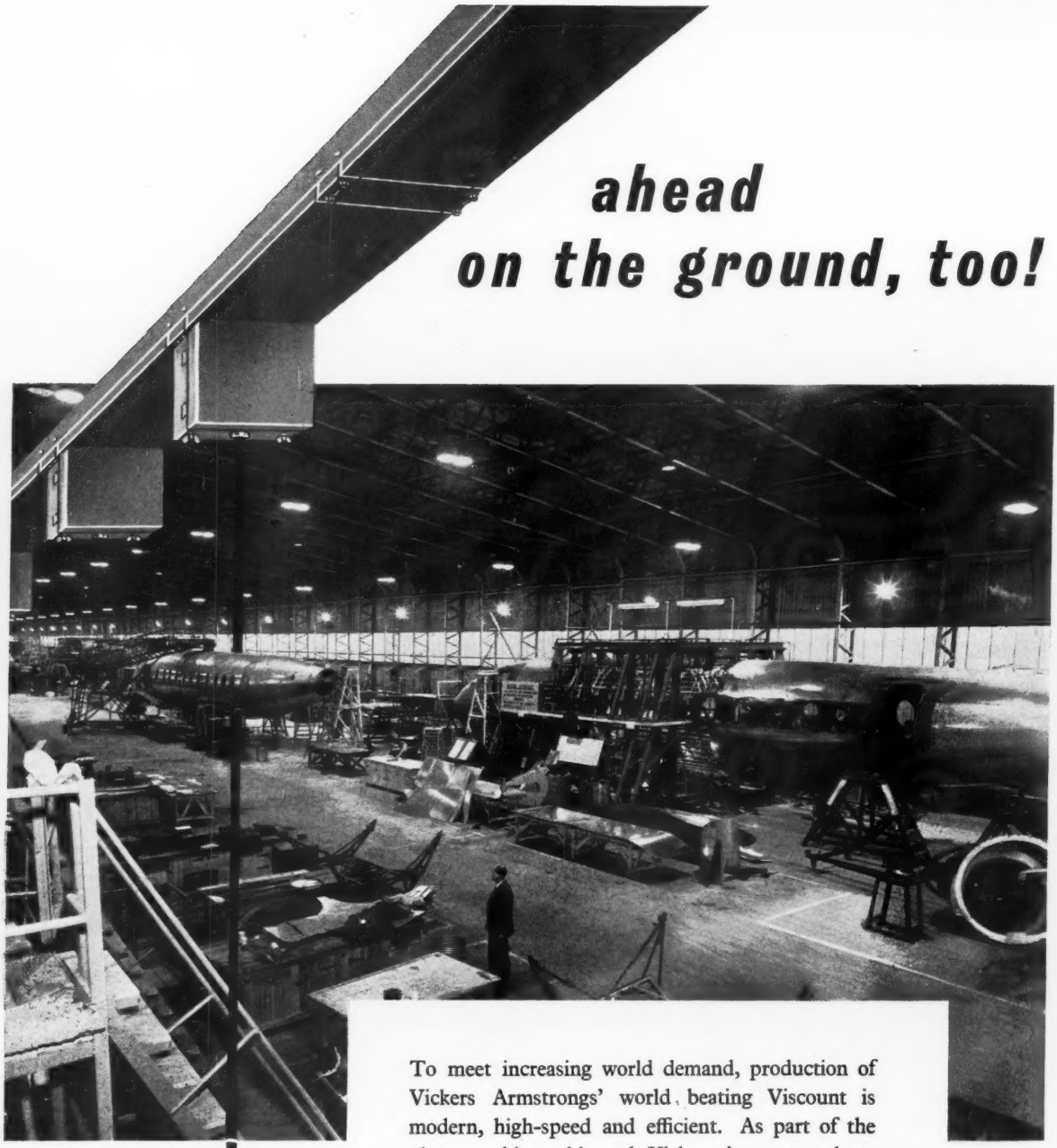
ahead on the ground, too!



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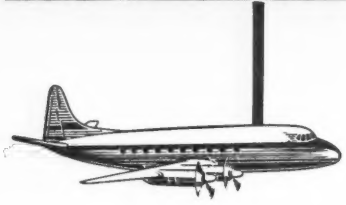

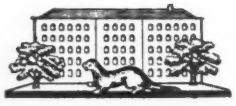

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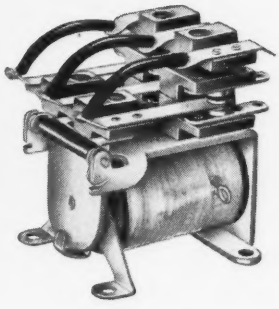
Vibration-proof relays

FOR AIRCRAFT AND INDUSTRIAL USE



These relays of simple and robust construction are designed to work under adverse conditions. The use of such features as high contact pressures and generous wiping action enable them to comply with the Service requirements of DES.1 and DEF.5000.

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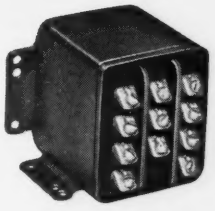

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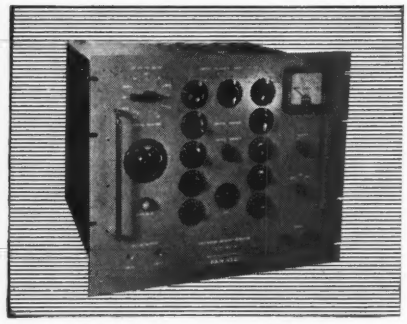

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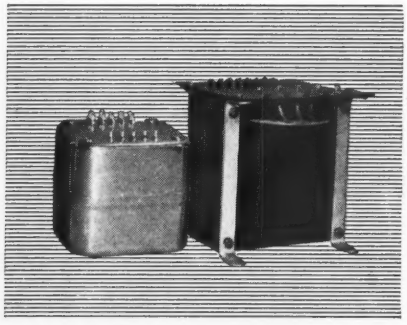
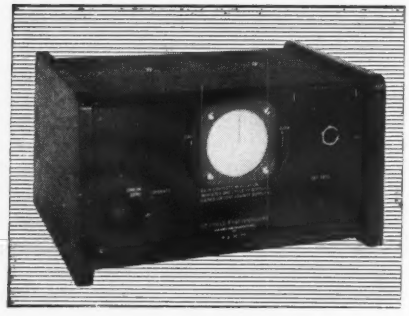


Open and Shrouded types of Transformers for general use in electronic equipment. Designed and manufactured to individual requirements



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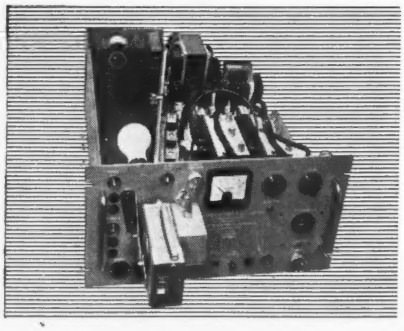

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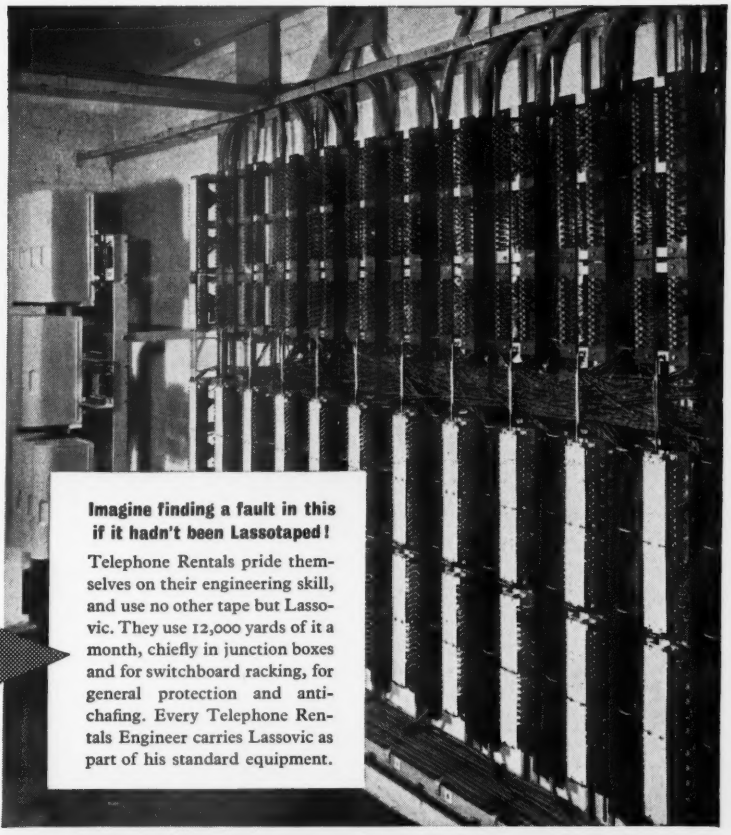

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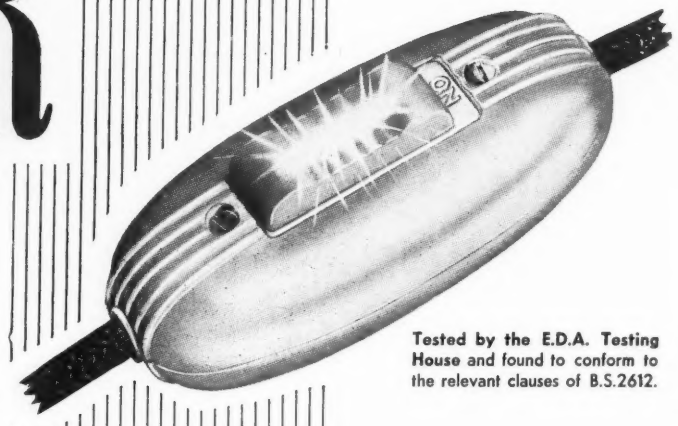

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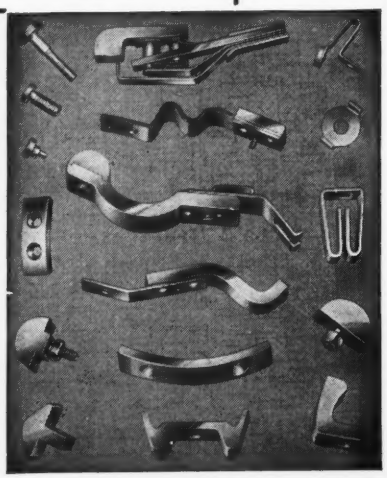

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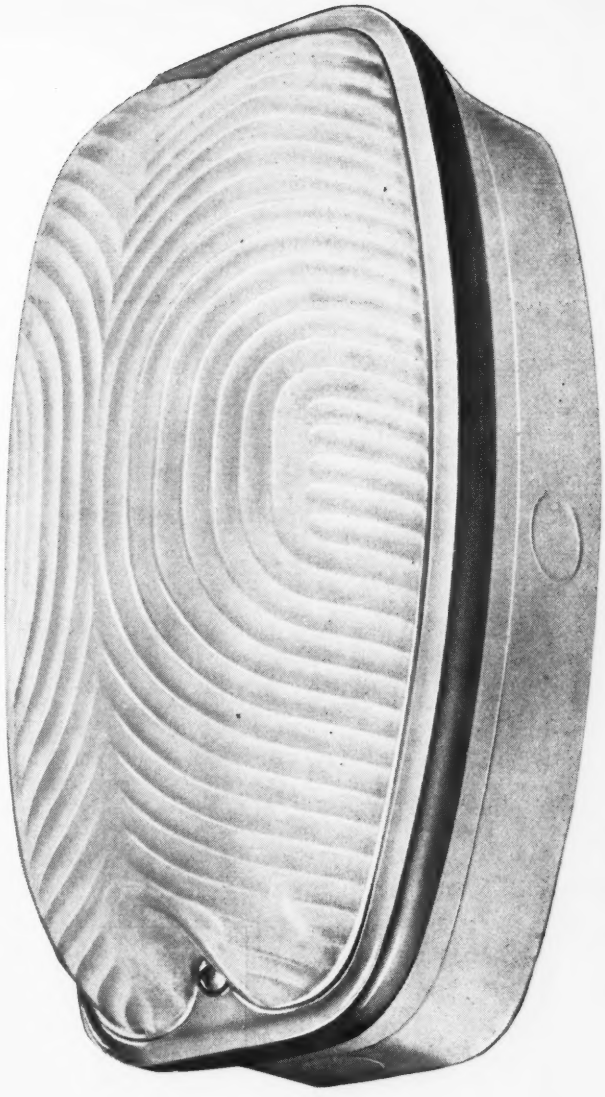

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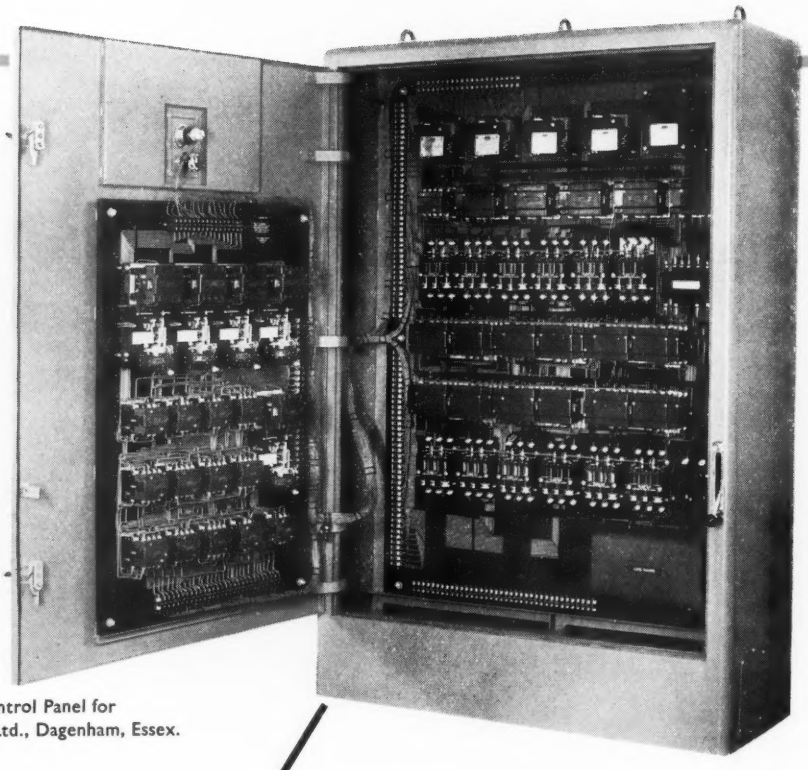
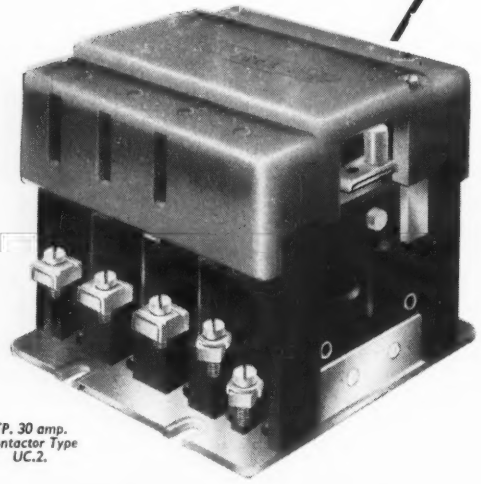


M.T.E. Multi-Motor Control Panel for
Ford Motor Company Ltd., Dagenham, Essex.



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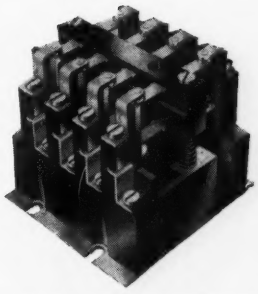
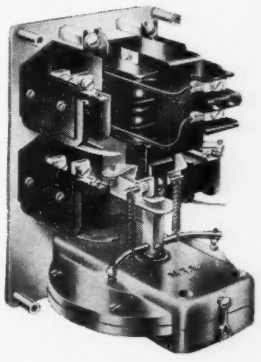
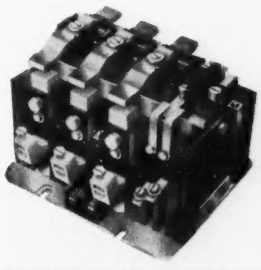


TYPE URI EIGHT-POLE DOUBLE-BREAK RELAY (cover removed)



TYPE UT ELECTRO-PNEUMATIC TIMER (cover removed)



TYPE UC3 75 AMP CONTACTOR (cover removed)

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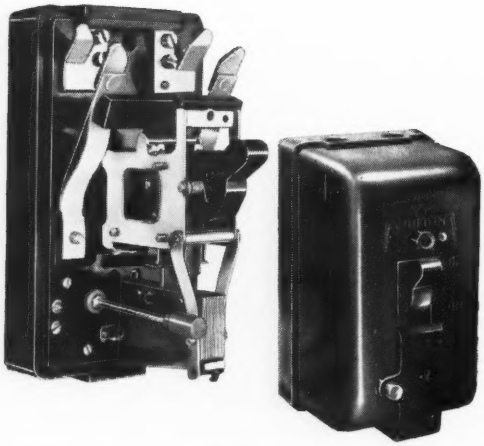

Chilton Earth Leakage Circuit Breakers

Type ELT A (without overload protection). With its inherent simplicity of design this Earth Leakage Circuit Breaker fully complies with B.S.842 and provides complete protection against the possibility of shock. Suitable for all current ratings up to 60 amperes and with voltage ratings up to 500 volts A.C. A special unit for 100 ampere rating can be supplied to order. Chilton Earth Leakage Circuit Breakers are supplied in insulated moulded enclosures and the earth leakage tripping mechanism has been specially designed to ensure reliable operation even after long periods of inactivity in dirty, dusty, greasy or humid conditions. Units incorporating overload protection can be supplied to order.

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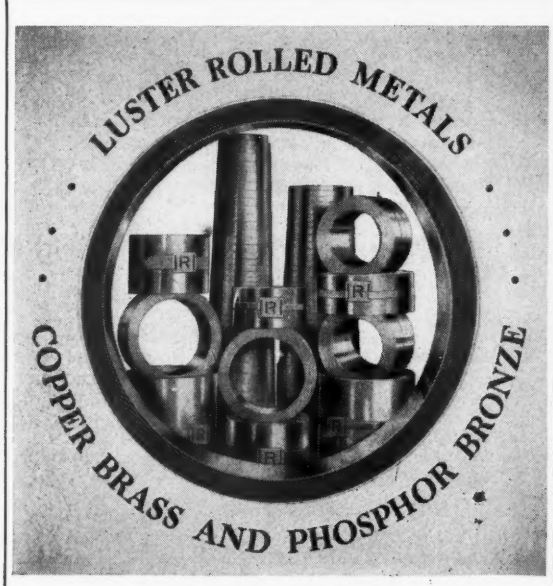

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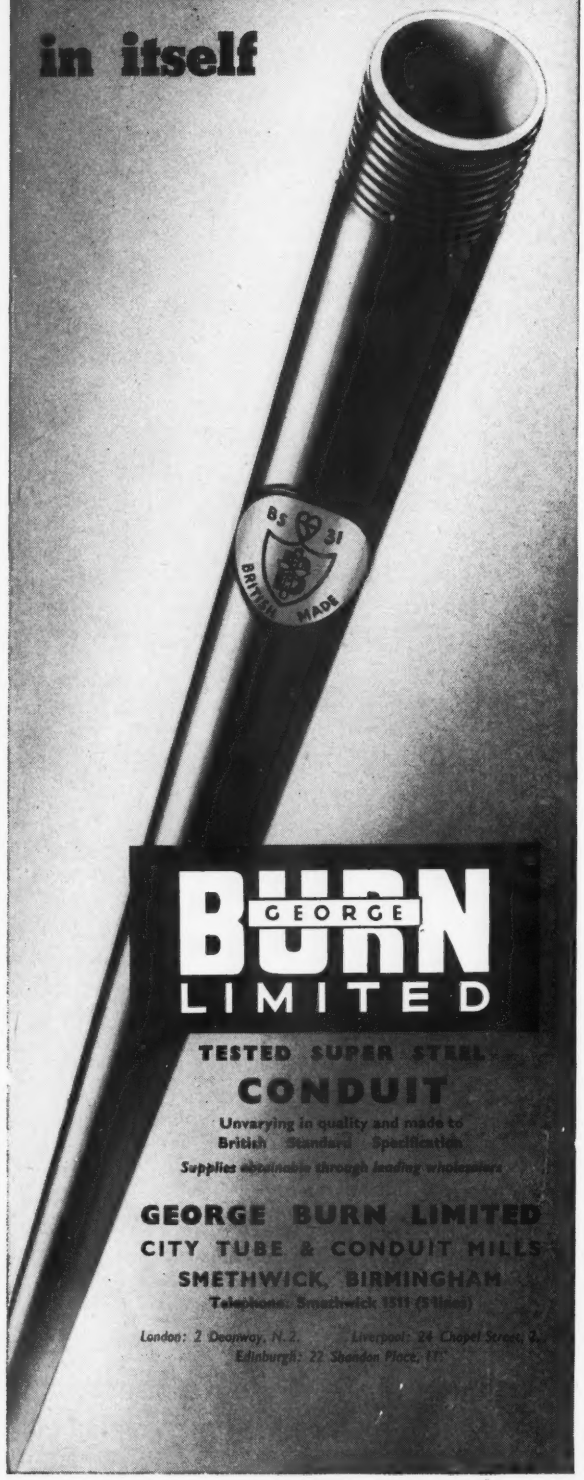

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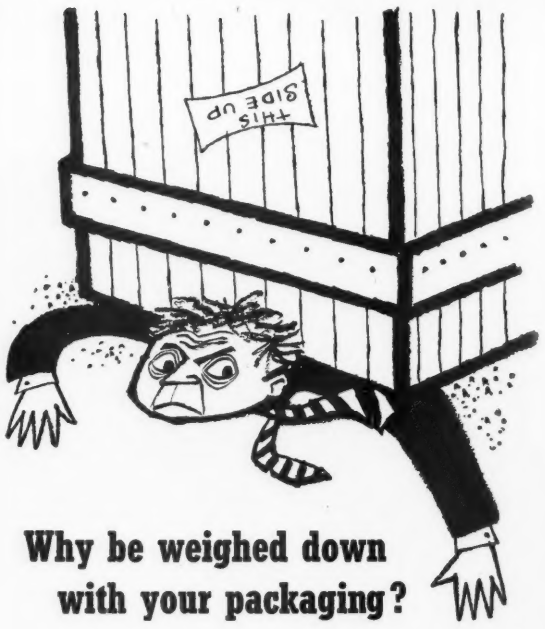

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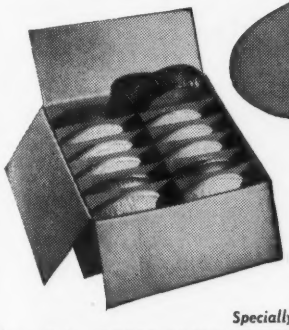

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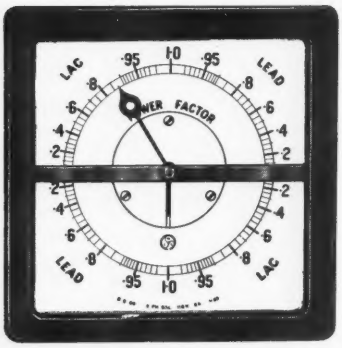

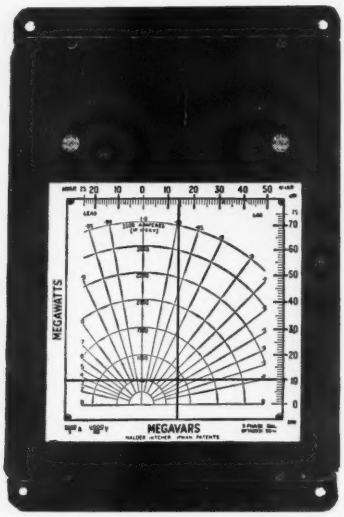

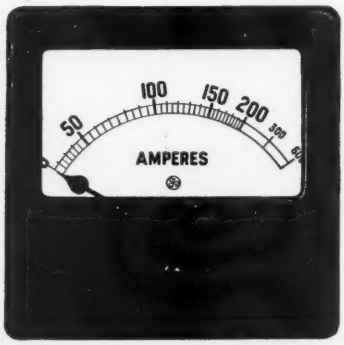

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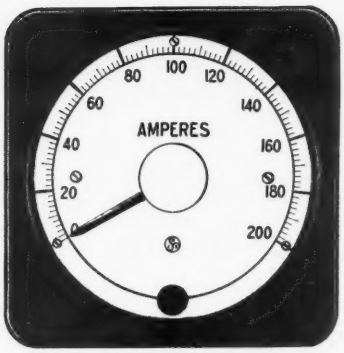

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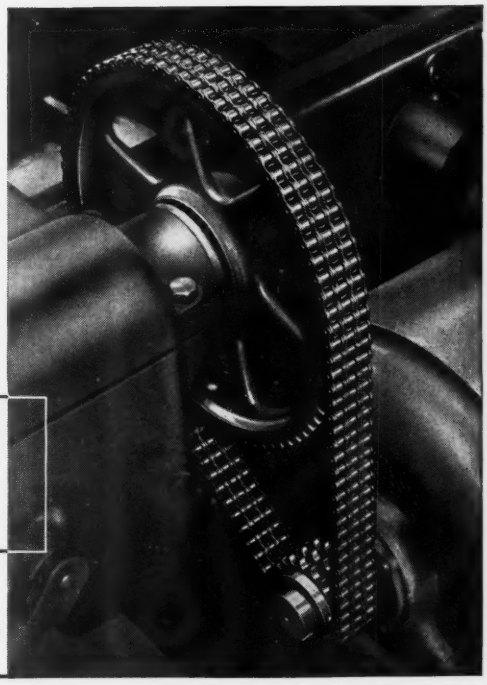

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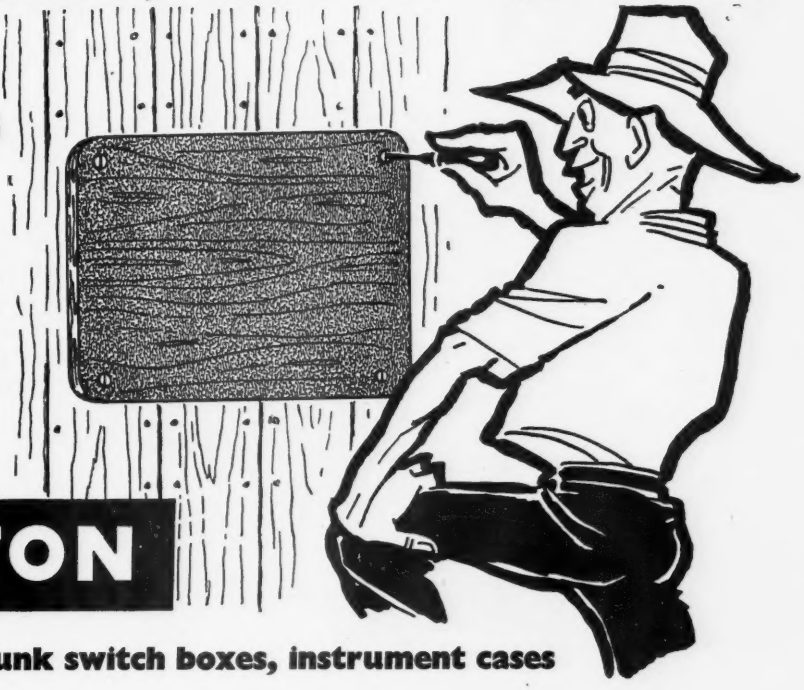

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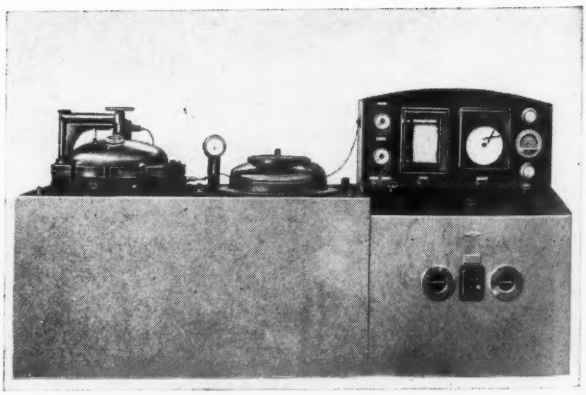

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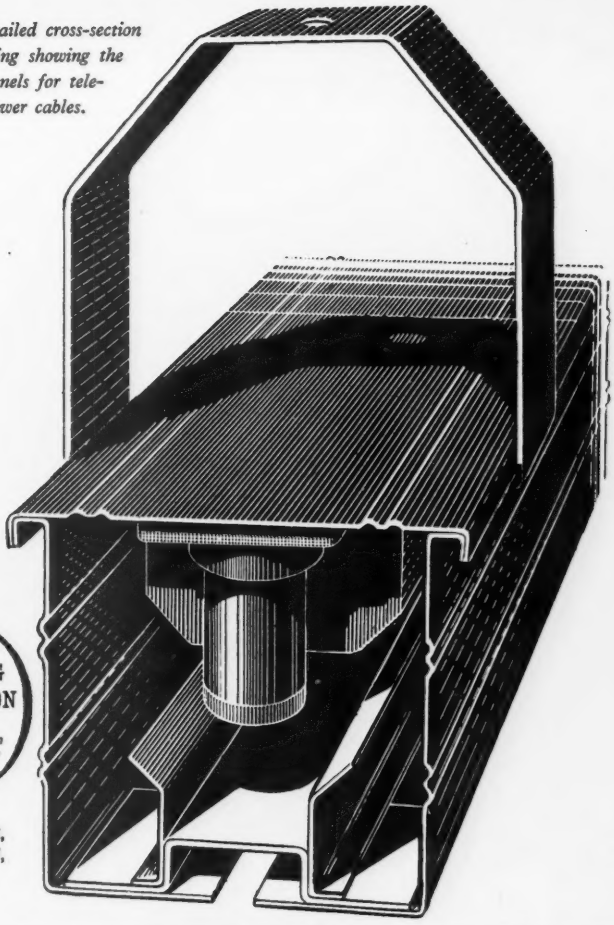

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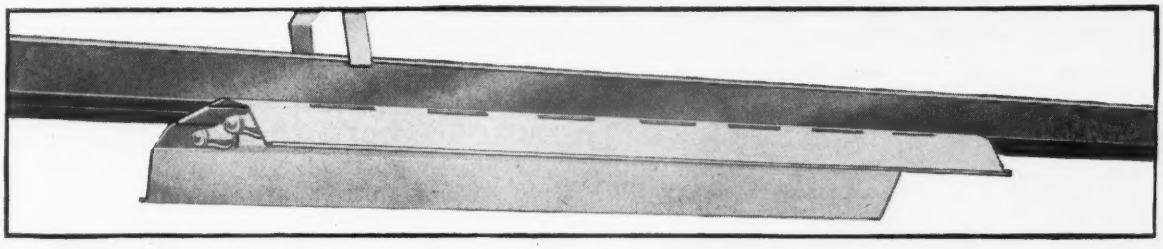

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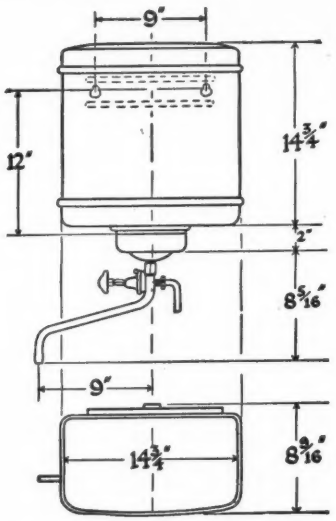

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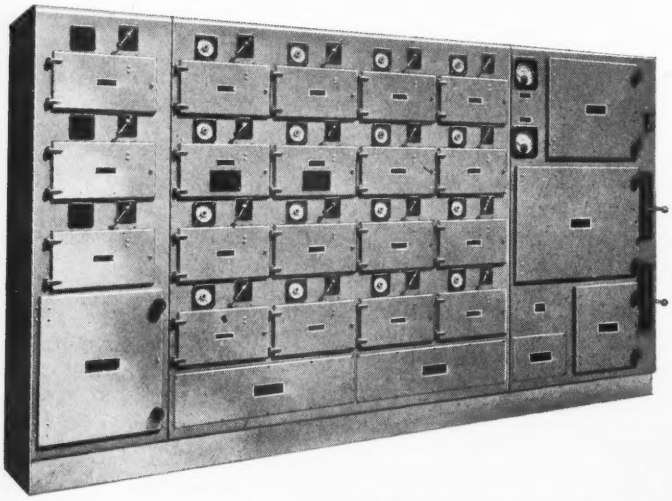

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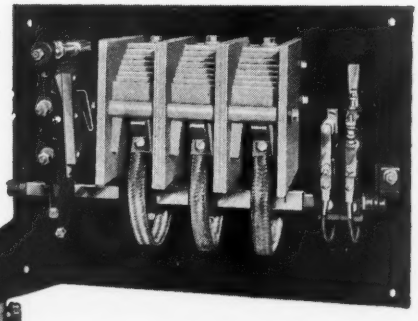

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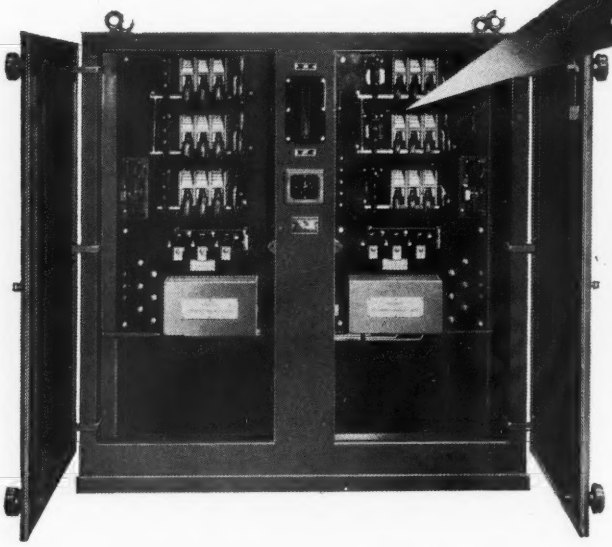

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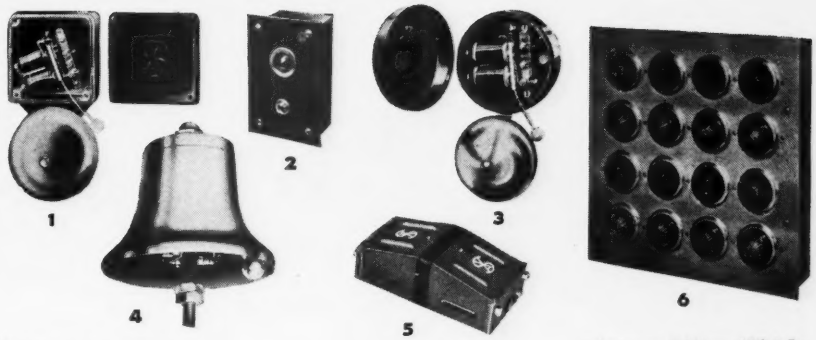

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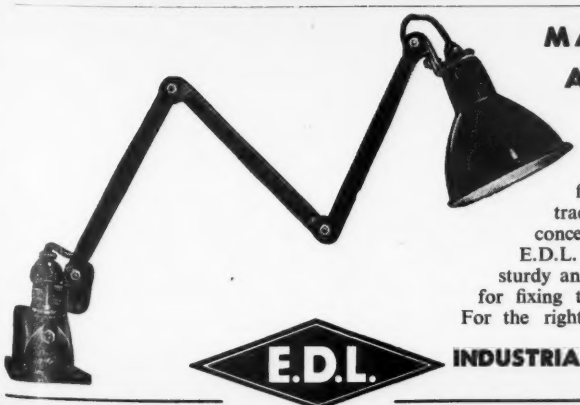

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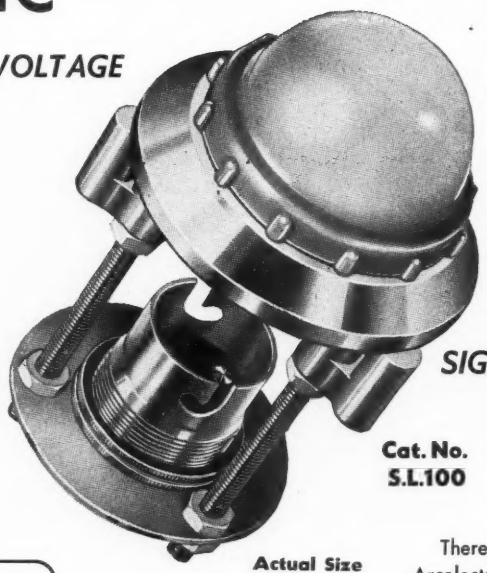

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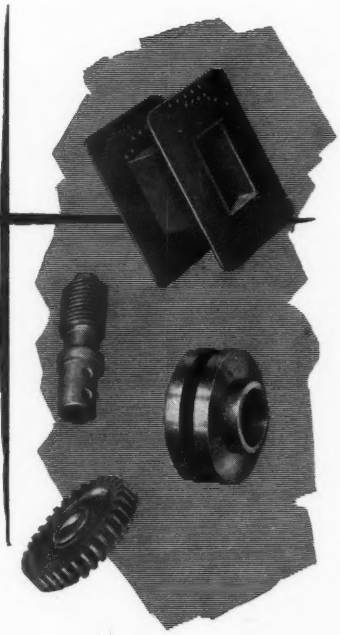

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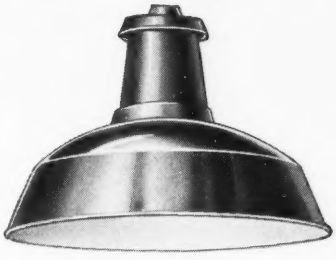

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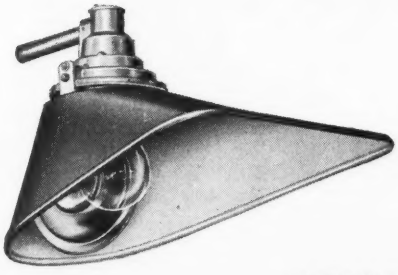
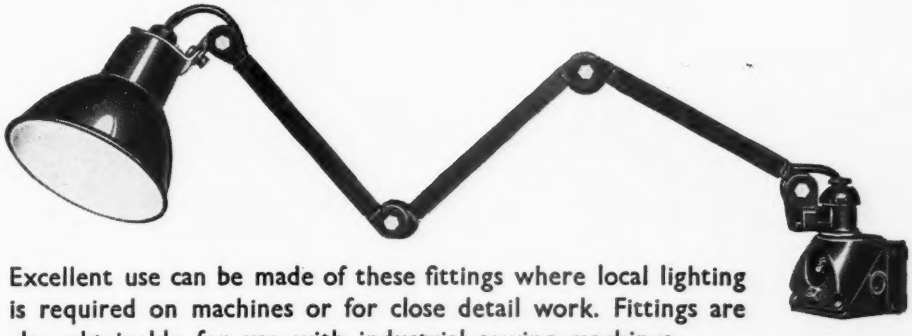


ANGLE FLOODLIGHT

This multi purpose exterior fitting is available for Pole Top, Pole Clamp, Wall, flat or corner mounting The reflector is adjustable

BENCHLIGHT FITTINGS



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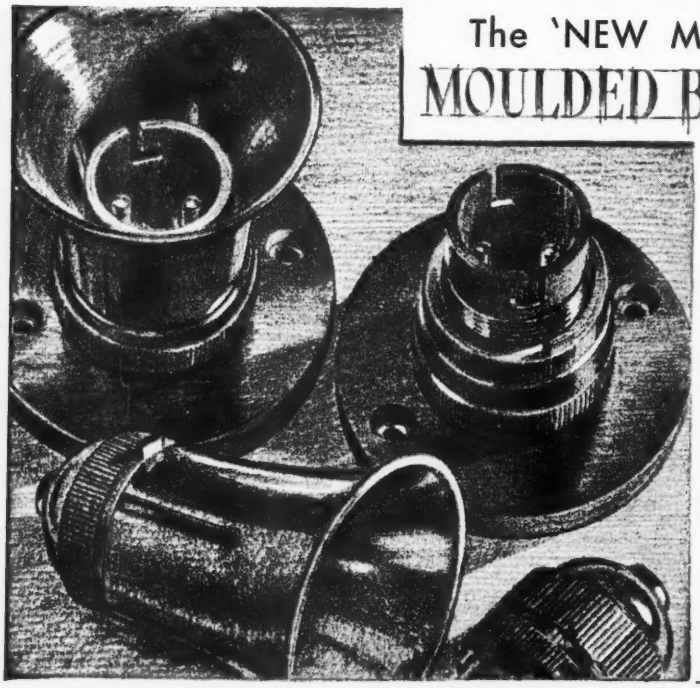

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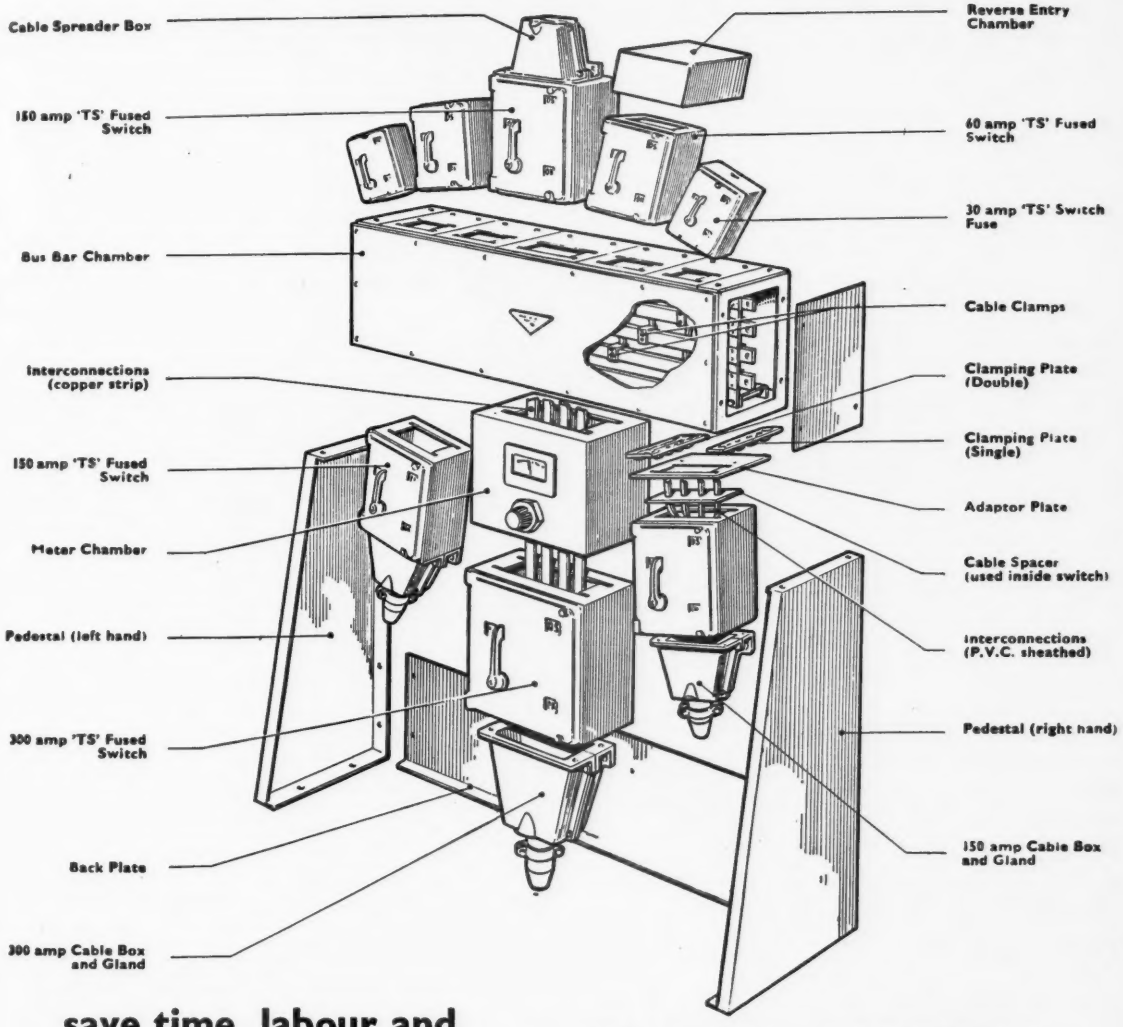

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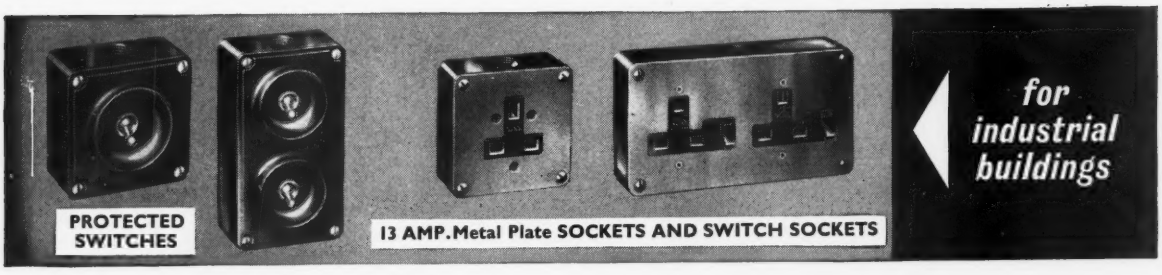

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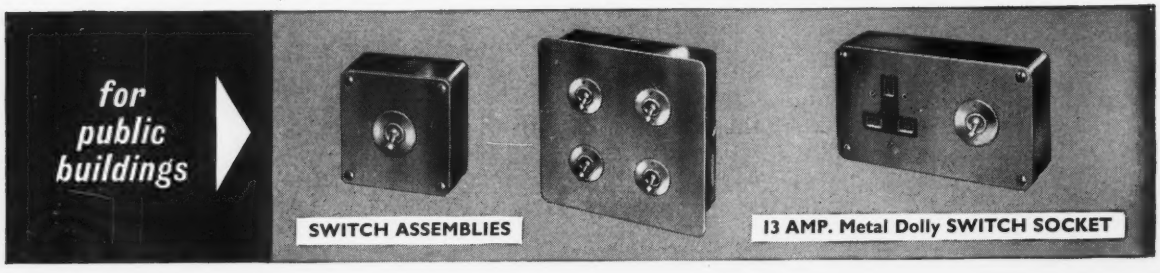

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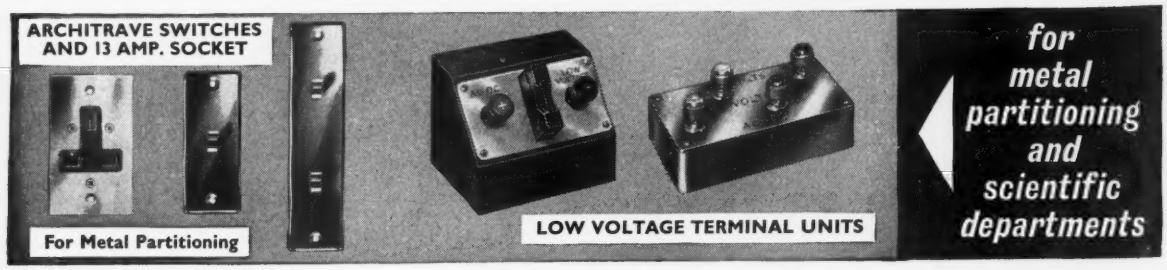
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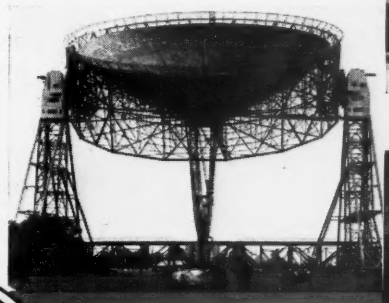

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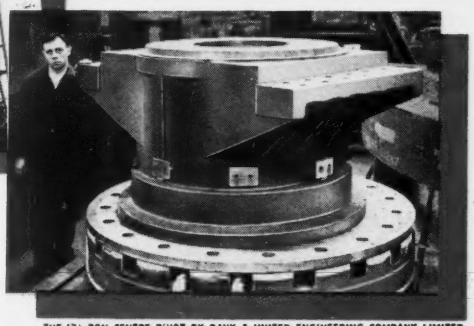

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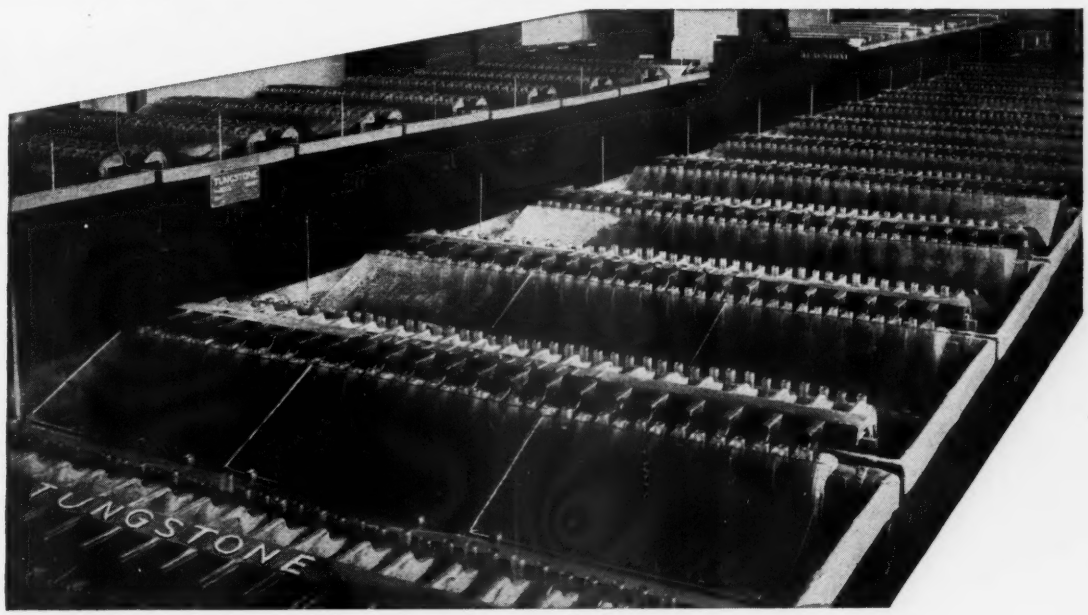

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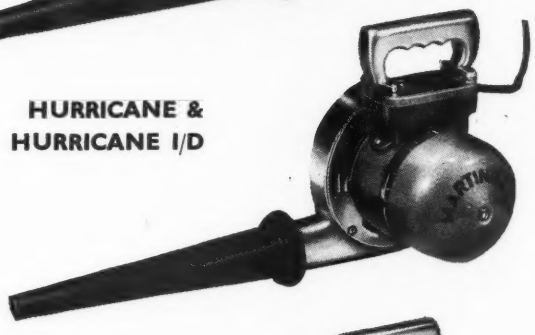

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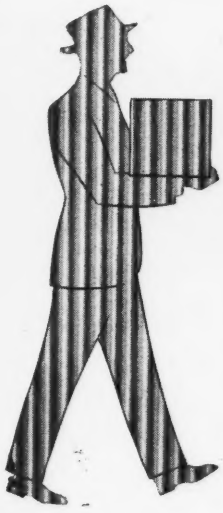

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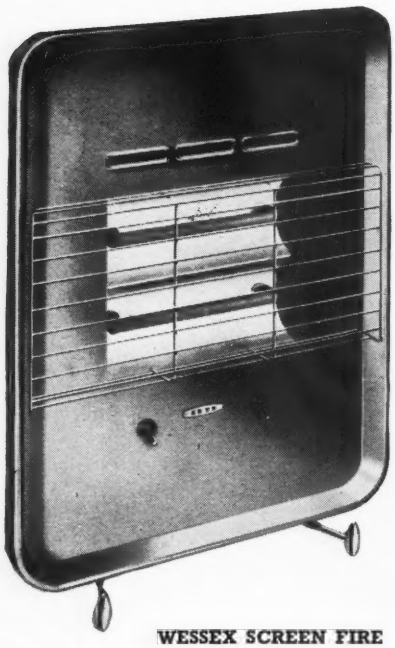

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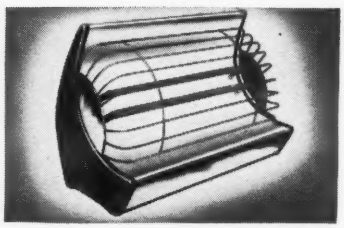

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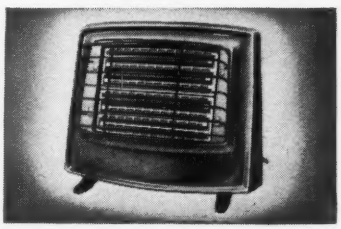
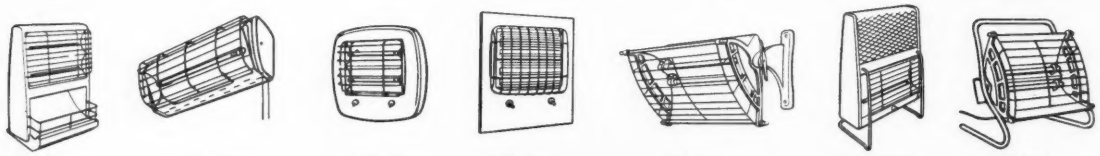


SOMERSET. A fire with superb finish and sound construction. Gleaming vitreous enamel finish with plated guard and block type elements. 1 k.w. or 2 k.w. Colours: Oyster Grey, Guardsman Red, Citron Yellow, Willow Green.



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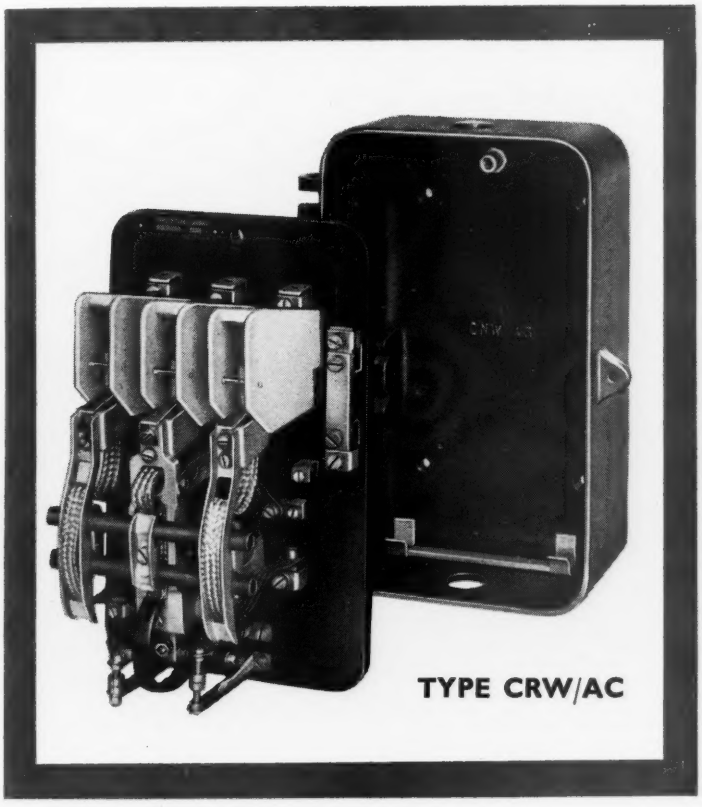

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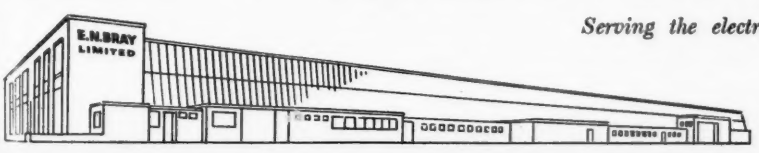

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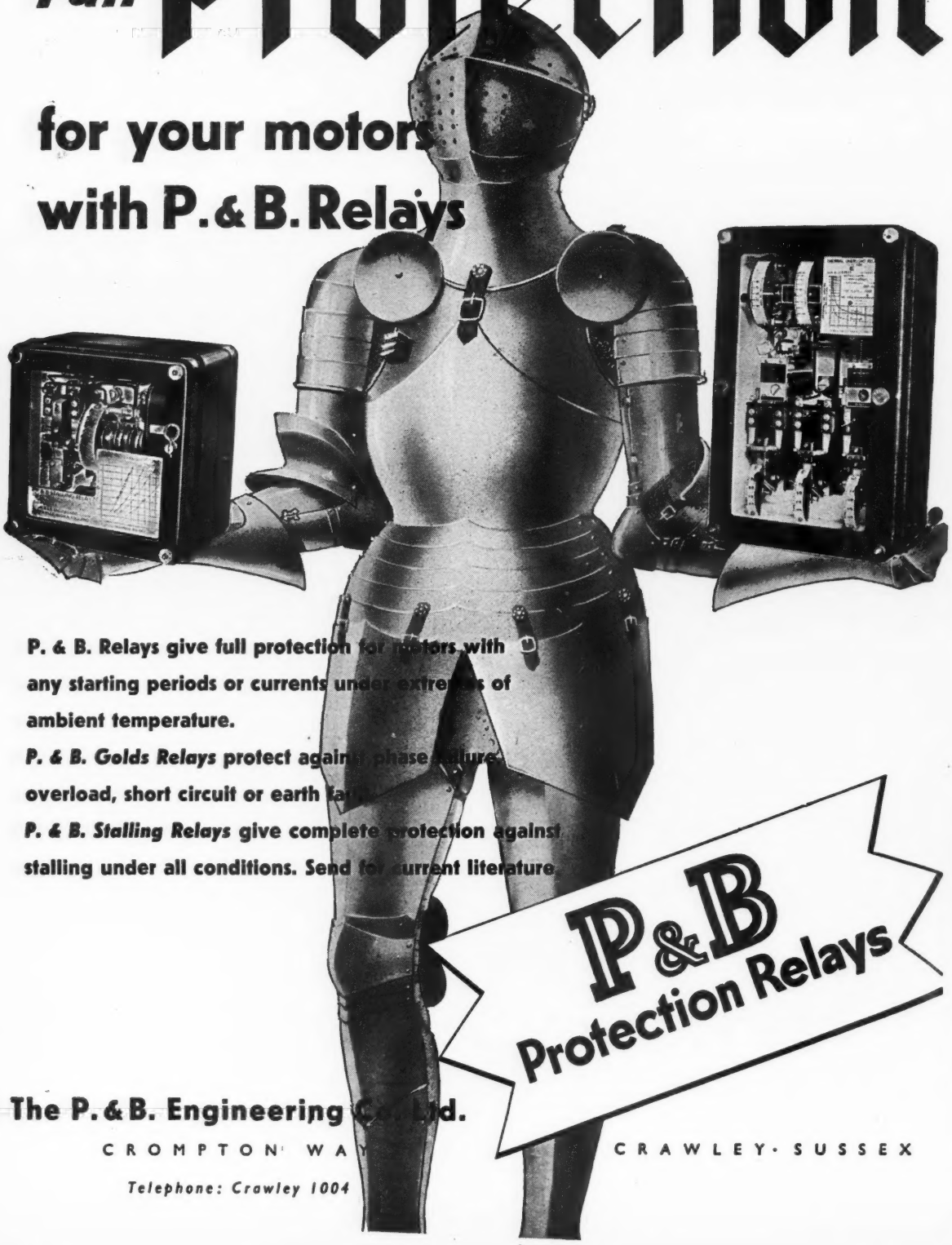

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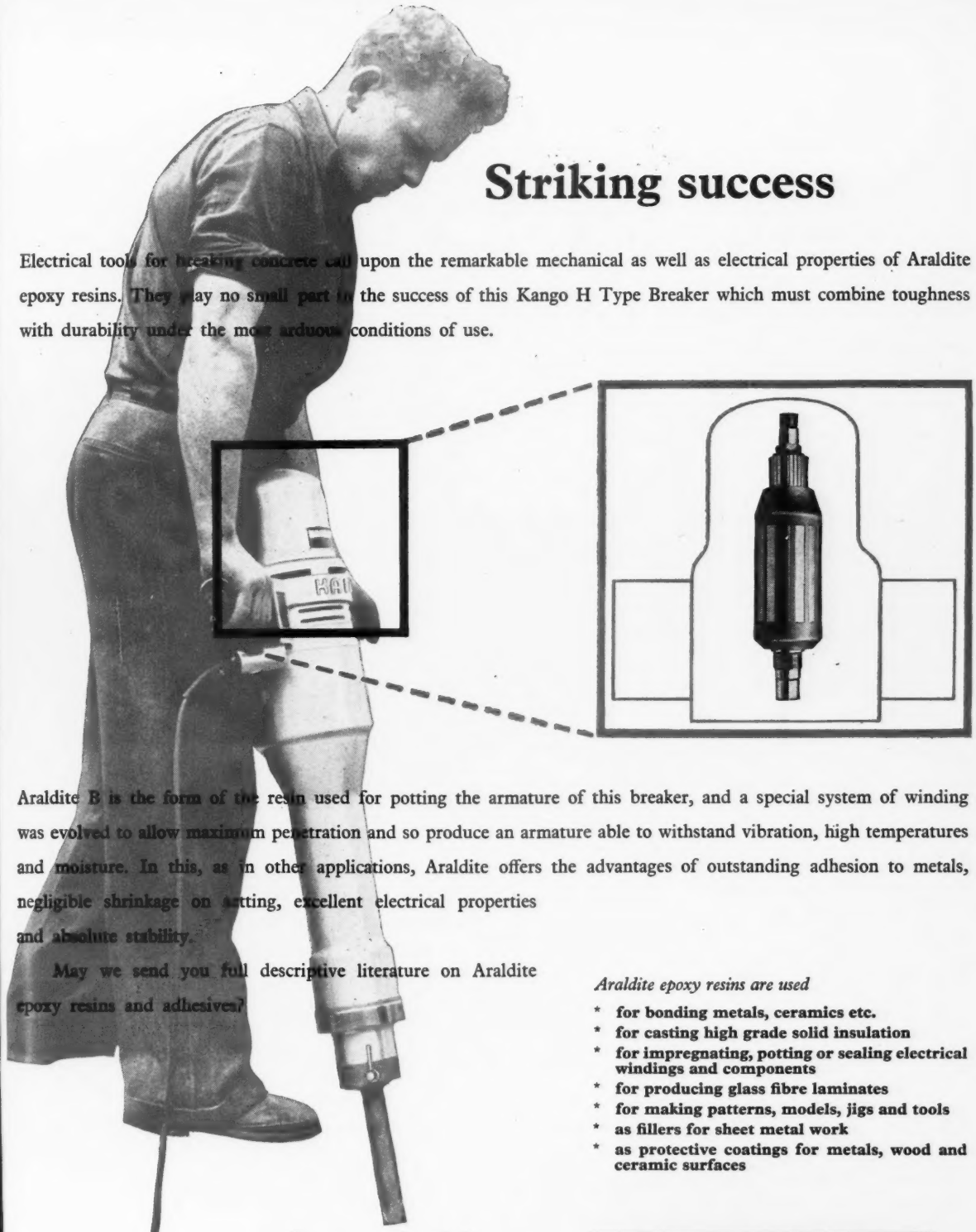

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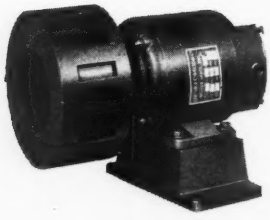

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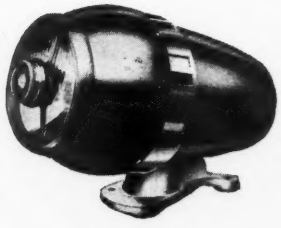

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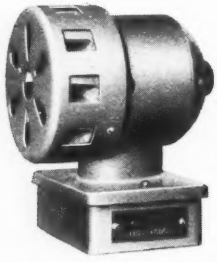

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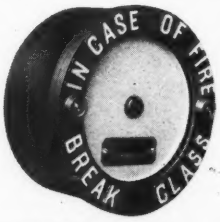

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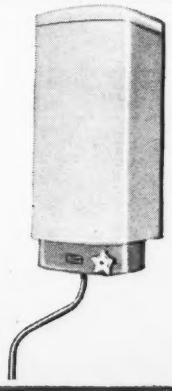

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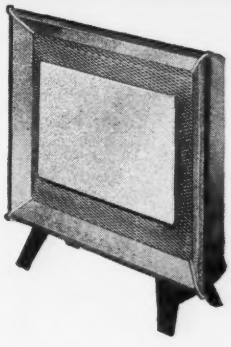

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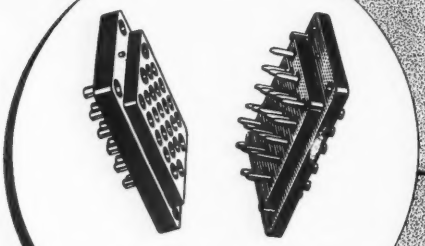

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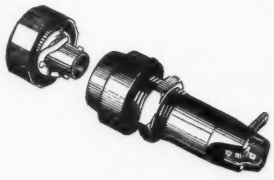

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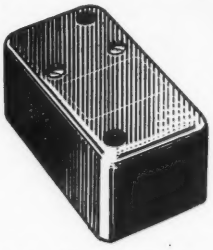

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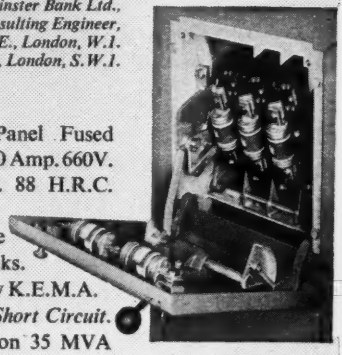

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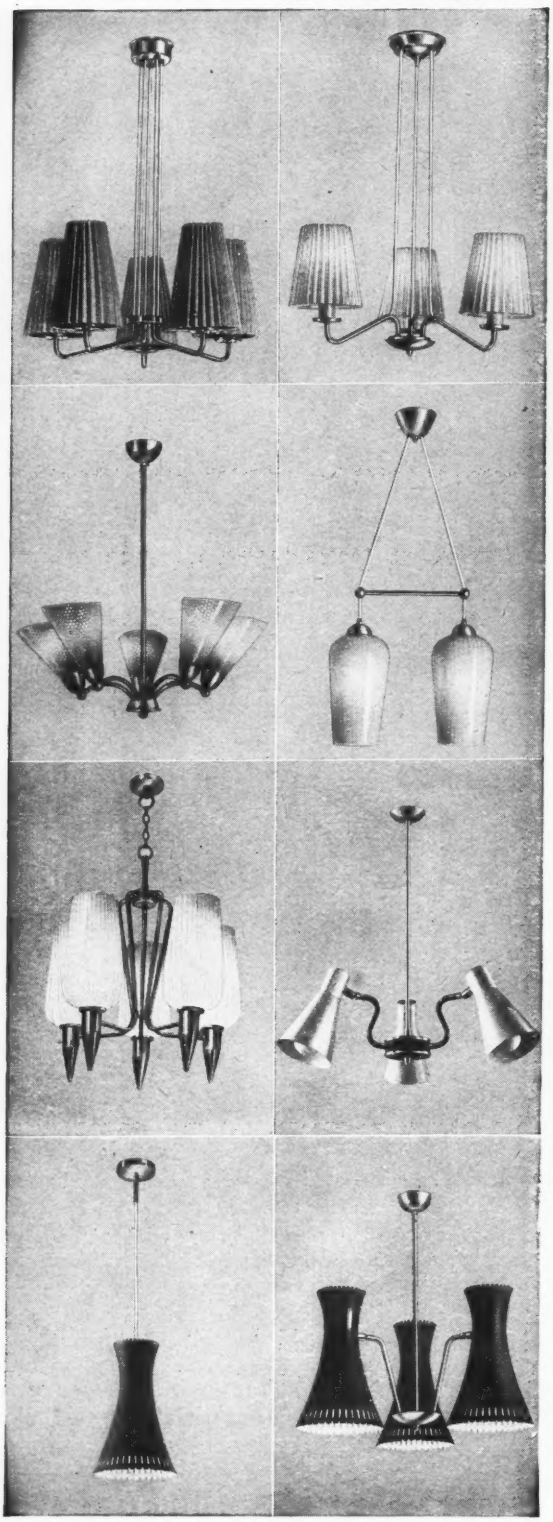

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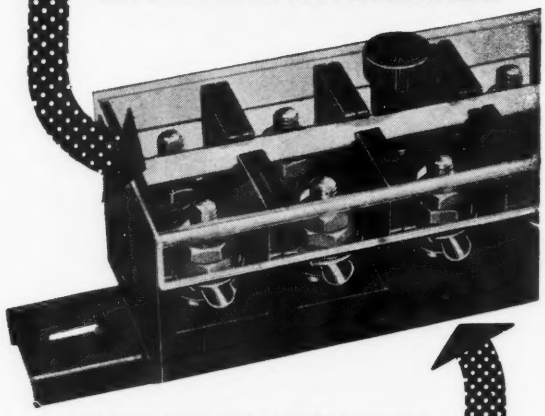

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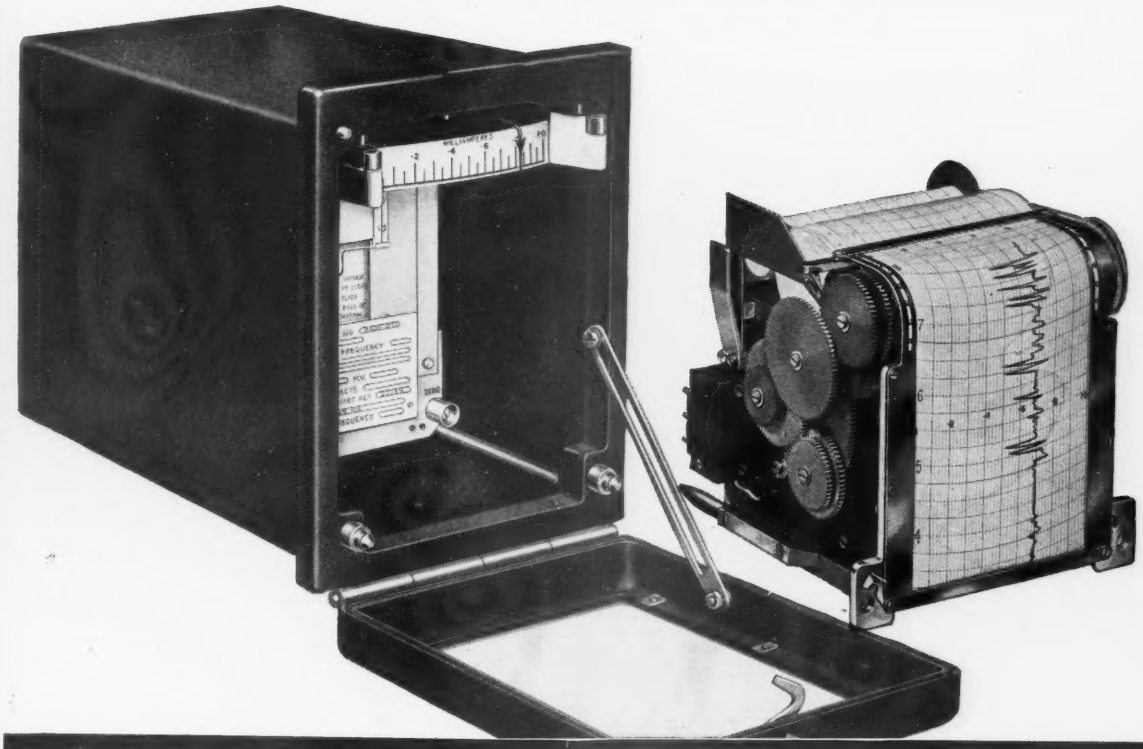

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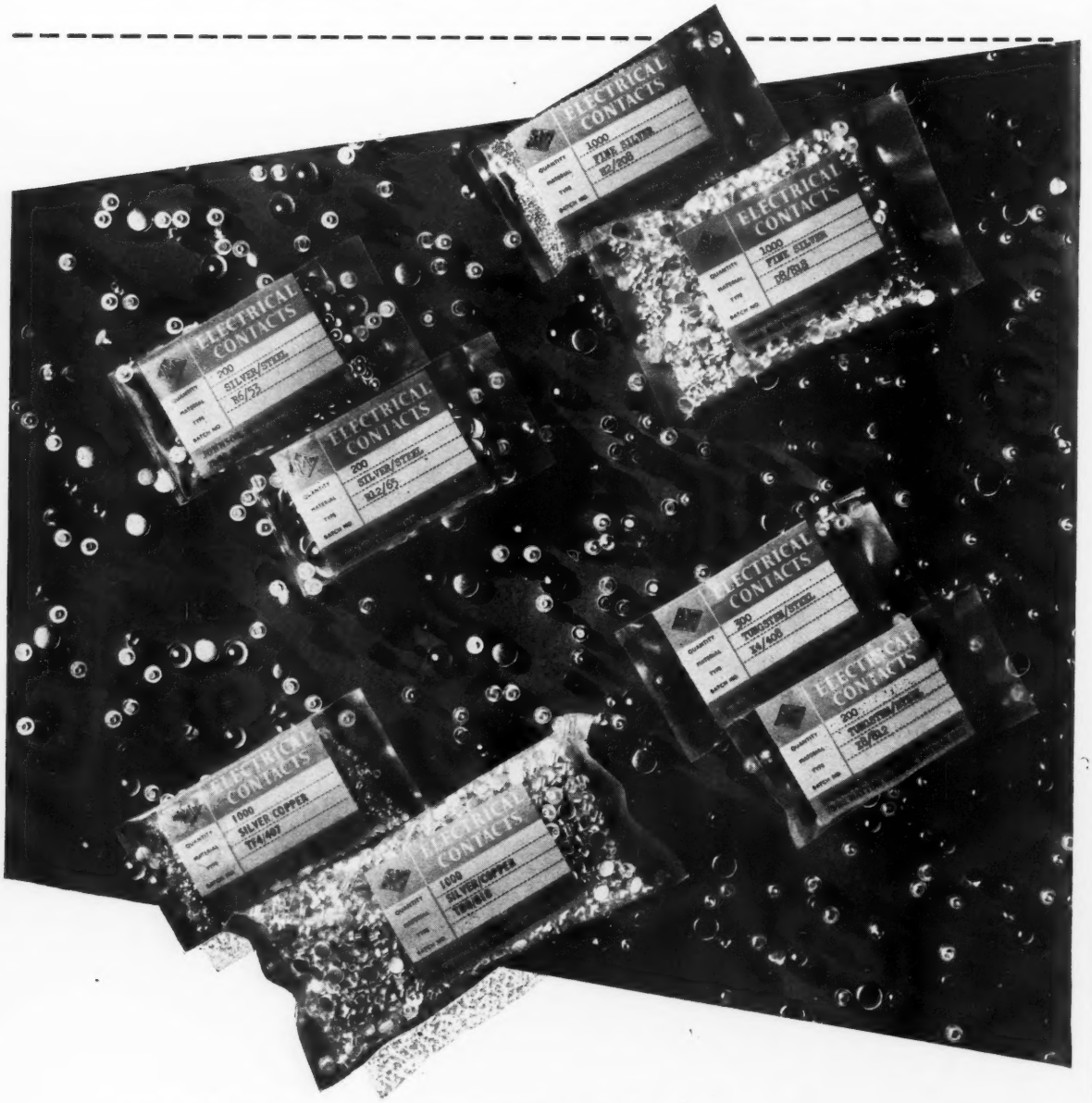

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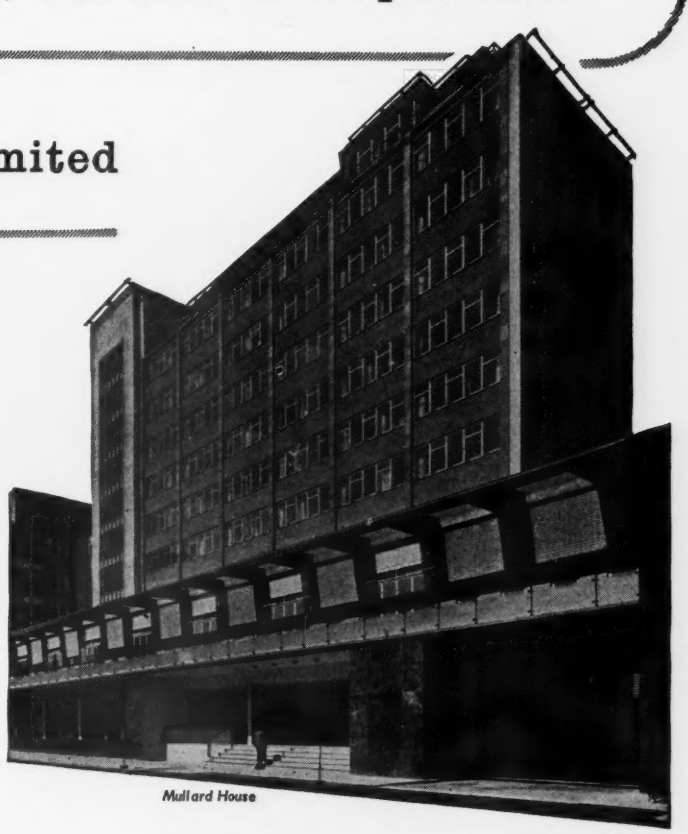

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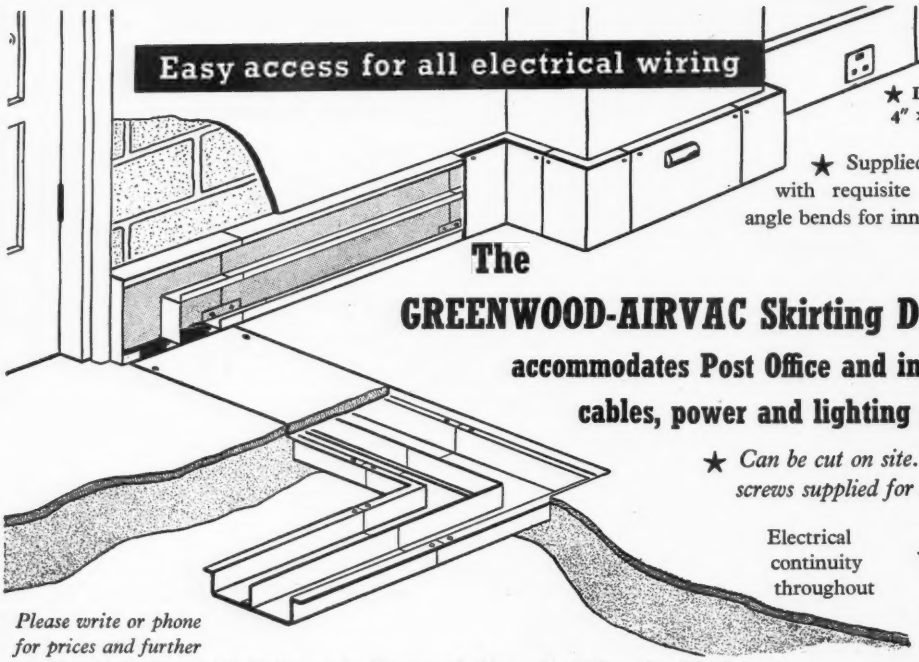

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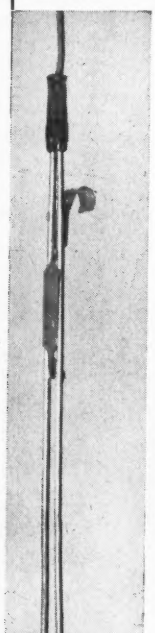

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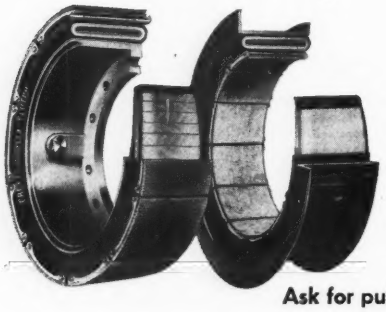

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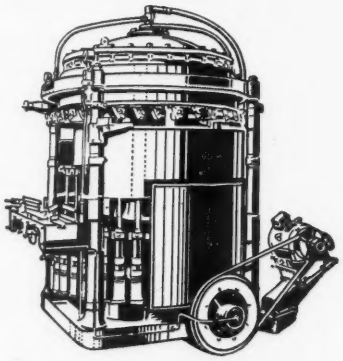

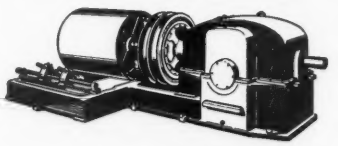

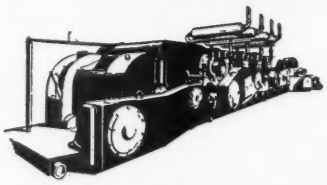

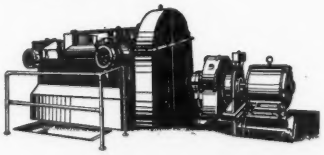

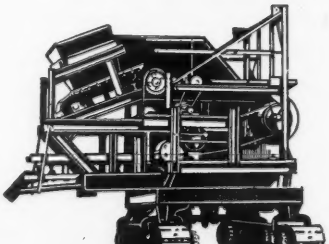

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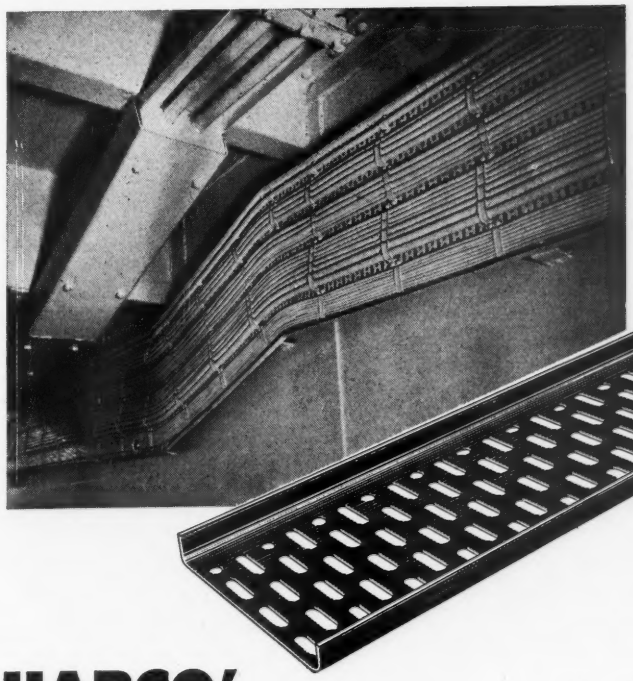

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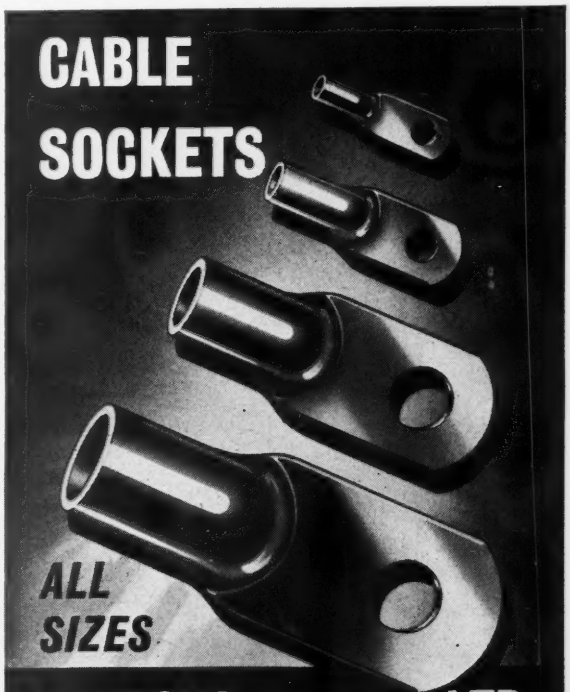

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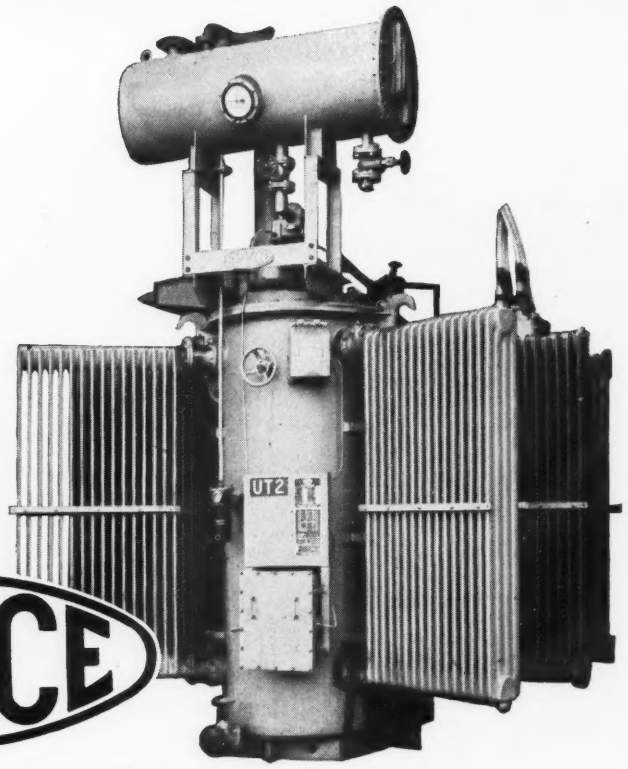

14 BRYCE Transformers

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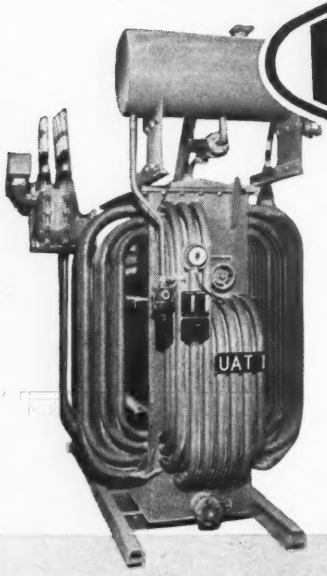
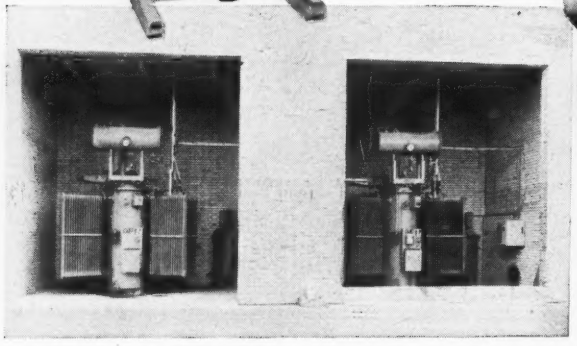
They range from 5,000 kVA, 11,000/3,450 volts to 400 kVA, 3,300/433 volts.





The examples illustrated are (top right and bottom left) 5,000 kVA, 11,000/3,450 volts; (upper left) 1,000 kVA, 3,300/433 volts; and (bottom right) 400 kVA, 3,300/433 volts.

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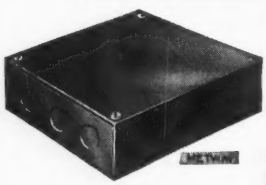

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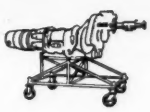

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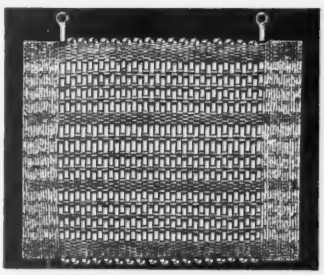

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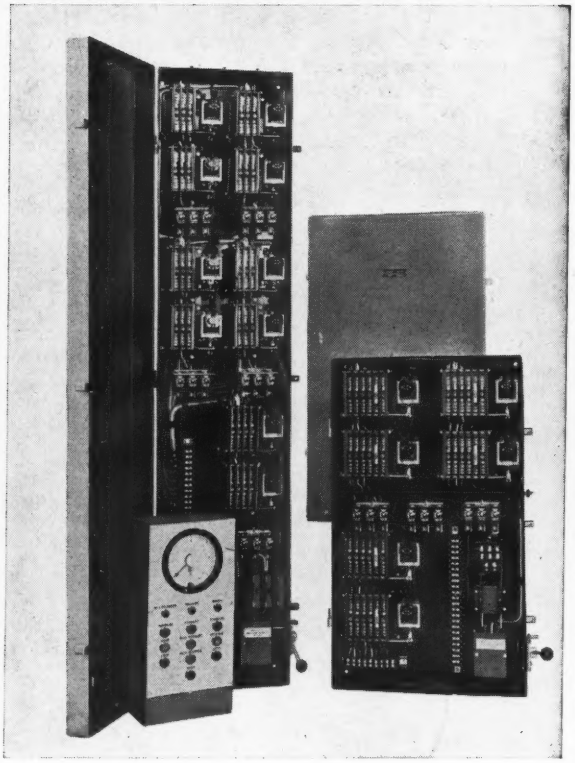

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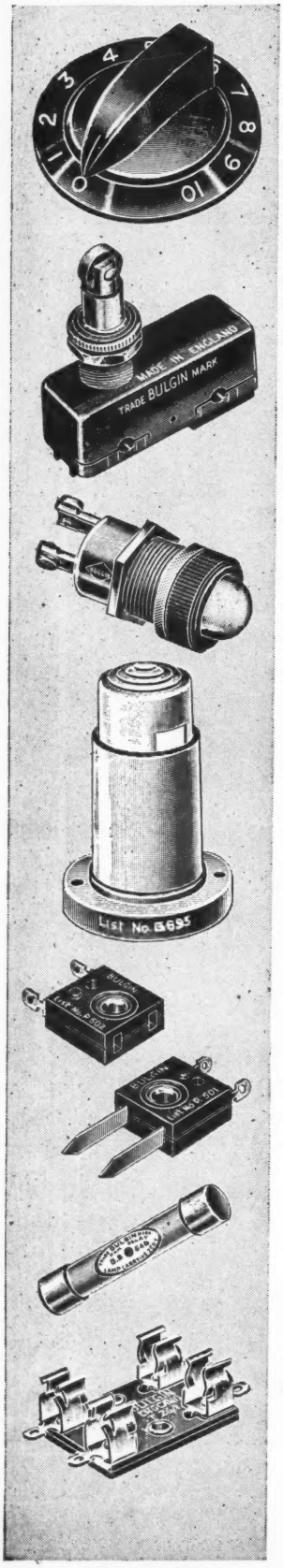

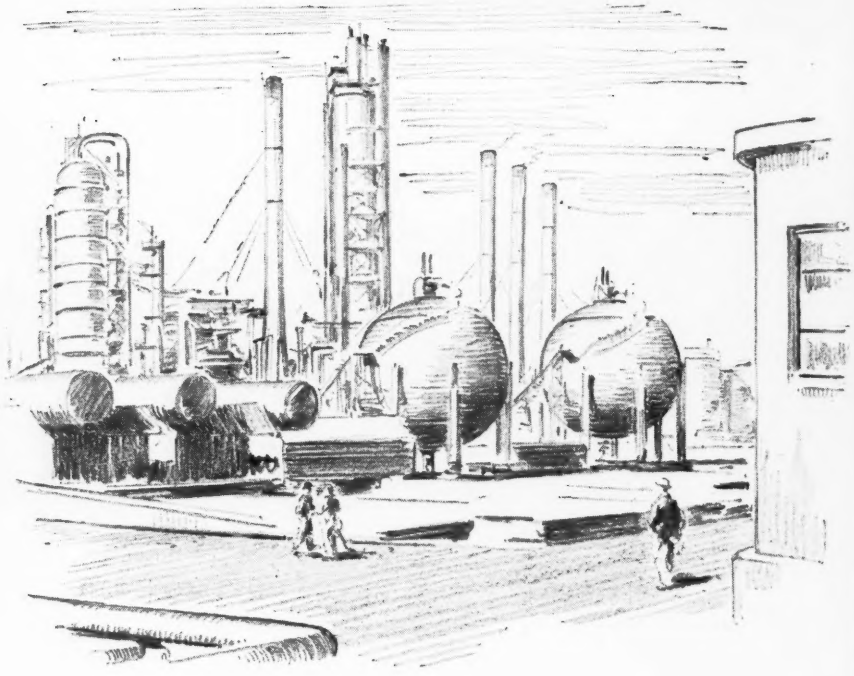

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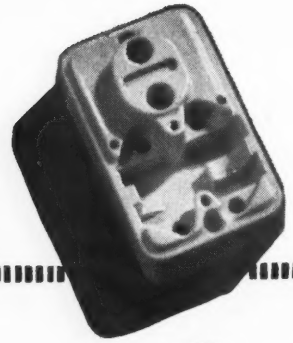

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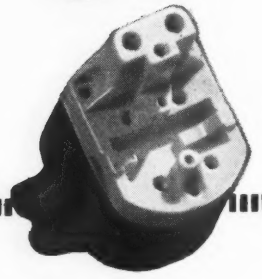

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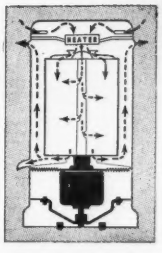

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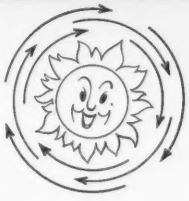

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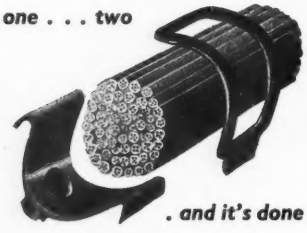

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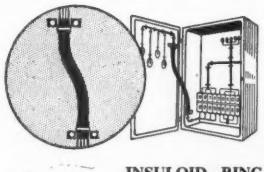

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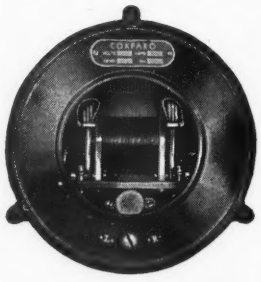

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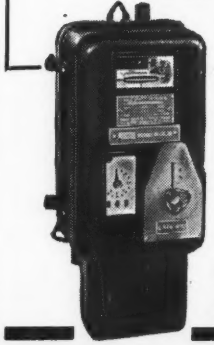

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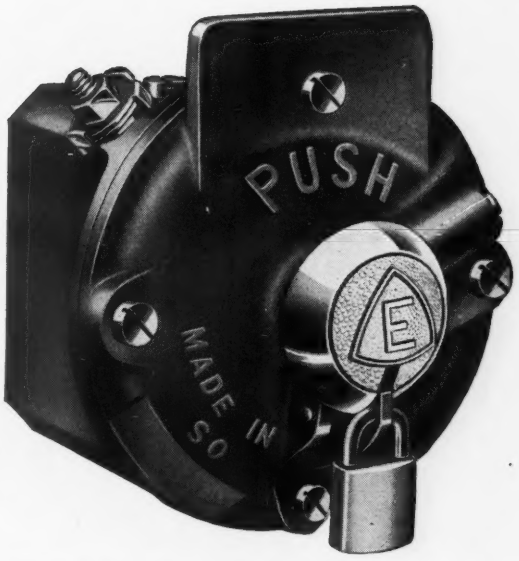

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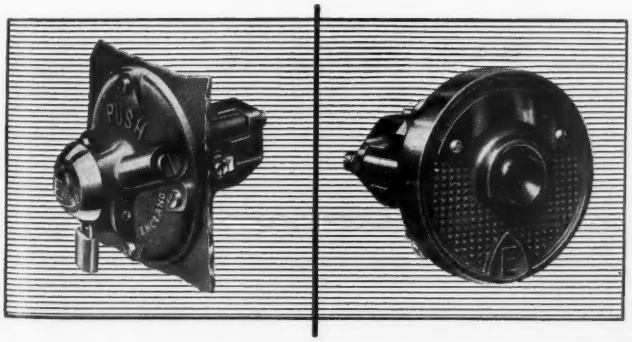

Left: **Panel Mounting Switch**
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Contacts similar to the Mark II switch.

Right: **Panel Mounting (Self-resetting) Switch**
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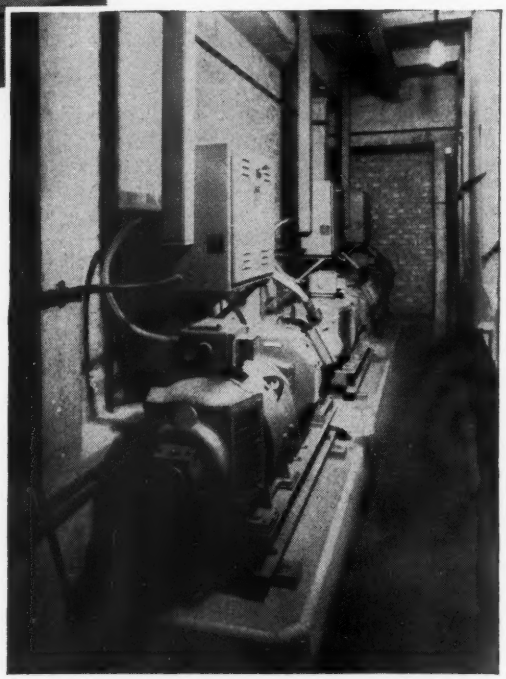

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ELECTRICAL REVIEW

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Atomic Energy and High Vacuum

THE extent to which the rapid development of atomic energy for use in generating electricity has depended on advances in high-vacuum techniques during the past ten years or so was strikingly illustrated by Dr. H. Kronberger (United Kingdom Atomic Energy Authority, Risley) in a paper presented on 8th November at a meeting of the Institution of Mechanical Engineers arranged in conjunction with the British Nuclear Engineering Conference. Three main applications were dealt with for which the requisite vacuum was generally within a range of 10^{-3} and 10^{-2} mm Hg.

Probably the most spectacular of these is exemplified in the prevention of damage by corrosion and toxic gases at Capenhurst diffusion plant, where the fissile isotope U235 is separated from the uranium body. Associated with this installation (by far the largest of its kind in Europe) are 100 miles of a pipework system, which includes many thousands of valves and flanged and welded joints in addition to various ancillary equipment. The vacuum must be maintained for operational reasons as well as for safety so as to withstand pressures both below and above atmospheric. The performance achieved has led to the confident expectation that if the system were evacuated and isolated it would take many years for the interior to approach the pressure of the surrounding atmosphere.

Another instance of the need for the highest degree of air-tightness possible is found in the more advanced types of reactors of the graphite-moderated type or of the "fast" type represented by Dounreay, for which carbon-dioxide coolants would be replaced by liquid metals, such as sodium, as a more efficient medium for the transfer of heat to the "boilers" (heat exchangers) of atomic power stations. In such designs tightness in combination with temperatures up to 1,100 deg F is essential chiefly to avoid contamination of reactor materials by the slightest trace of sodium oxide. For a third group the prime requirement is to avoid water leakage. At Calder Hall a main object was to minimise water seepage into the carbon-dioxide system from the heat exchangers, each consisting of 1,000 tubes 30oft in length. Since water at high temperatures, particularly when exposed to irradiation, is very corrosive, pressurised-water reactors present especial tightness problems, which are being studied experimentally at temperatures up to 660 deg F at 2,500 lb/sq in.

While the design of atomic energy plant owes much to the ability of British manufacturers to produce large high-vacuum systems of proved reliability, the initial stimulus was clearly furnished by the Atomic Energy Authority. A secondary effect may be, as Dr. Kronberger points out, a wider recognition of the potential advantages of high-vacuum techniques in the wider field of testing the tightness of plant not necessarily intended to operate under high-vacuum conditions.

BRUSSELS EXHIBITION

Sir Norman Kipping, director-general of the Federation of British Industries, at a conference last week, spoke of the impressive display which British industry is arranging at the Brussels Universal and International Exhibition to be held from April to October next year. He stressed the importance of the co-operative Electrical Section being organised by seven trade associations, to which we made extended reference in our issue of 25th October. He also referred to the separate exhibits of the Nuclear Power Plant Co., the Atomic Energy Authority and individual companies.

This affords another opportunity of drawing the attention of those electrical concerns who have not yet contributed towards the cost of the Electrical Section to the desirability of their doing so. In view of the efforts being made by other industrial nations at the Exhibition it is imperative that Great Britain's leading export industry shall be worthily and fully represented. We may repeat that offers of assistance should be addressed to the Organising Committee of the Electrical Section, 36, Kingsway, London, W.C.2.

TURBO-ALTERNATOR COOLING

In an effort to raise the thermal efficiency of generating plant the size of turbo alternators is being increased continuously. Theoretically, the size of turbo alternators can be increased almost indefinitely but mechanical, physical and transport problems do impose limits. Ministry of Transport regulations preclude the movement by road of items weighing more than 150 to 160 tons, which is the stator weight of the 100 MW machines of immediate post-war designs. This means that makers are restricted in frame size and the limitation on machine output is thermal, the problem of increasing output resolving itself mainly into one of removing heat from the alternator windings. This accounts for the recent development of various methods of alternator cooling.

In this issue we describe a system of direct cooling for both stators and rotors, using hollow conductors and hydrogen, which has been developed by the English Electric Co., Ltd. The first machine of this type will be installed in the Willington power station of the Central Electricity Authority and as will be seen from our article, the main aim of the designers has been to achieve the maximum efficiency combined with maximum simplicity of the plant.

CHINESE SCENE

In the matter of trade relations with Great Britain China adopts an attitude of benevolent neutrality. At least that is the impression gained from remarks by Mr. F. J. Erroll, Parliamentary Secretary to the Board of Trade, at a conference last week upon his return from a visit to the Far East. Chinese links with Russia are very close but not apparently so close as to exclude all other countries from trade relations. The Russians and their associates have provided much in the way of industrial equipment, information and advice but the Chinese are still anxious to acquire technical knowledge from other sources. Mr. Erroll warned manufacturers, however, that they should be chary of divulging information derived from hard-won experience merely to enable the Chinese to " do it themselves."

There seems to be no general method of doing business with China: each would-be exporter must make his individual inquiries. And it is desirable that these should start in London through the Chinese Embassy, with the assistance of the Board of Trade.

THE WINDSCALE ACCIDENT

The recent accident with the plutonium producing reactor at the Windscale establishment of the United Kingdom Atomic Energy Authority has set many engineers wondering whether this sort of thing could occur in reactors of the Calder Hall type. When Sir William Penney introduced the Government's White Paper on the accident to the Press in London last week, he explained that the accident which happened at Windscale could not happen with the Calder Hall reactors or with the reactors being built for the electricity authorities.

In a graphite moderated reactor " Wigner energy " from decelerating neutrons becomes stored in the graphite during operation. This must be released periodically by heating the graphite above normal operating temperature. The Windscale accident occurred during a Wigner release and was primarily due to human error and insufficient instrumentation for the guidance of the operators. Because of the operating conditions prevailing in Calder Hall type reactors Wigner releases will be required much less frequently, say about every five years, and at the same time the instrumentation is much more comprehensive. Apart from this, Calder Hall reactors operate with closed-circuit cooling systems, so that even if an accident did occur, there could be no release of radioactive material to the surrounding countryside.

FAIR TRADING

We do not wish to re-open the arguments which were raised when the Restrictive Trade Practices Act was going through Parliament, but the issue of a second Order under the Act by the Board of Trade is a reminder of the dreadful expense and waste of time in which industry has been involved. It is said that under the first Order about 1,300 agreements have been entered with the Registrar and the Restrictive Trade Practices Court has hardly begun to function so far. Among the agreements picked for early consideration are some relating to electrical goods; in the meantime doubt and uncertainty will continue.

One body affected by all this is the Electrical Fair Trading Council. During the twenty-four years of its existence the Council has done much to straighten out the industry's trading structure. Its aims are to secure an adequate reward for those who perform useful services and prevent the granting of discounts to those who do nothing to earn them. The Council has nothing to do with price fixing, it exercises no " sanctions," and the adoption of its recommendations is purely voluntary. Nevertheless the Fair Trading Policy and its schedules have had to be registered. Maybe the phraseology of the Policy could be altered to make its voluntary nature clearer, but the industry, and the public, would be much worse off if the Policy had to be abandoned.

Turbo-Alternator Developments

Problems Involved in Designing Very Large Machines

THE economic case for very large turbo-alternators in thermal power stations is now very well established and when we visited the Stafford works of the English Electric Co., Ltd., last week we saw something of the challenge which is being made to alternator designers and builders by the current demand for increasingly large machines. The main limitations on increasing alternator outputs are those of size and weight. Although to a large extent these are interdependent, each has a separate influence on the way in which the problem is tackled. For example, when considering increasing the size, the differential thermal expansion effects, particularly between copper and steel, are more serious, and the production of sound forgings having the necessary higher physical properties becomes increasingly difficult.

Generally speaking, the physical dimensions of the stator frame preclude transport by rail in this country so that the Ministry of Transport weight limit of 150 to 160 tons net for movement by road applies. The stator weight of the 100 MW machines of immediate post-war designs is close to this figure and although some increase in output could be obtained by raising the hydrogen pressure and by adopting a "two-piece" type of construction in which the core and windings are built and transported separately for assembly in the main frame at site, it was clear some years ago that a much more fundamental change was necessary if unit sizes of above 200 MW were to be achieved.

For many years the available magnetic materials have been worked up to their limit and, apart from the small advantage that can be gained from the use of oriented grain steel for the stator core, no substantial increase in output can be looked for in this direction. It remains therefore for the uprating to be obtained by raising the loss intensity in the stator and rotor windings. This, in turn, necessitates the use of a much more effective method of heat removal which has come to be known as direct, or conductor, cooling. The coolant is circulated in actual contact with the copper, thus eliminating the thermal barrier of the insulation around the coils.

The overall effect is illustrated in Fig. 1 which shows to a base of hydrogen pressure the current-carrying capacities for a given temperature rise of the stator and rotor windings when directly cooled as compared with conventionally cooled. These curves emphasise the

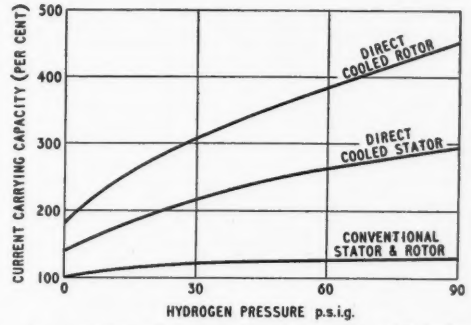


Fig. 1.—Variation of current-carrying capacity with hydrogen pressure

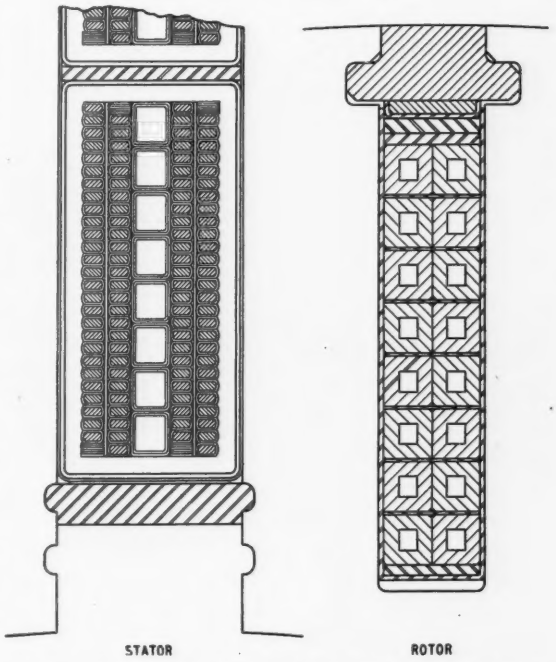


Fig. 2.—Cross-sections of stator and rotor slots in the new design of machine

influence of the gas pressure in machines of the new type in which the temperature rise of the gas itself is now the major component in the total temperature rise of the copper.

Having now established the need to employ the principle of direct cooling, it is necessary to consider what coolant should be used. It is well known that liquids, notably water, are much better media than gases and at first sight a liquid is the obvious choice. The application of water or oil to the cooling of the stator coils, while introducing considerable complication, is quite practicable; but in the cases of the stator core and of the rotor winding, which is the most highly rated part of a machine, the problems are formidable. Hence for these latter components the use of hydrogen is at present necessary.

In the case of the stator winding the choice between liquid and gas can be made on other considerations. Owing to the high voltage of the windings, it is impracticable to provide openings in the stator coils for the inlet and exit of the coolant elsewhere than at the ends so that the coolant flow path must extend at least over the full length of a coil side or of a number of coil sides in series. When liquid is employed it is essential that the ducts are sufficiently robust to ensure that leakage cannot develop; in effect this means that some, or all, of the individual laminations going to make up the conductors have to be tubular in form. Furthermore, since the eddy current loss in a lamination is proportional to the fourth power of the depth, the tubular lamination must necessarily be kept very small if the eddy current losses are

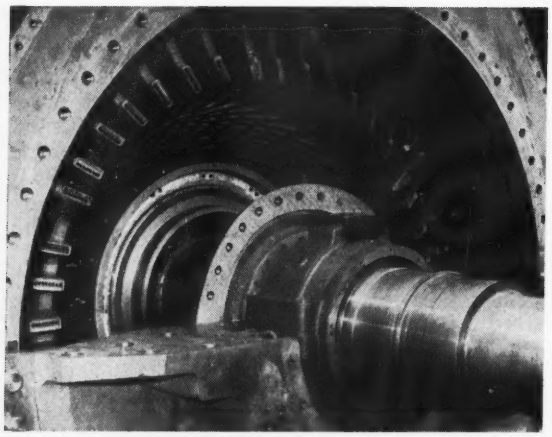


Fig. 3.—Stator coils of direct-cooled alternator showing gas ports

Fig. 4.—Rotor end windings of direct-cooled alternator

to be held down to such a value that they do not result in a lowering of the machine efficiency. With very small sizes there is the risk that ducts may become blocked, and there are manufacturing problems both in the production of the tubes themselves and in their brazing to form the connections from coil to coil.

If gas is used, ducts can be formed from thin-walled material because there is no problem of leakage. Hence they can be made of relatively large section and independent of the current-carrying strands. The pressure drop along such a coil side can be readily made equal to that required by the rotor, and by the stator core if it is also cooled by axial rather than by the more usual radial ducts. Thus, an overall ventilation system can be achieved which is very efficient in terms of both cooling and pumping power loss, particularly as only about a quarter of the rate of gas circulation around the machine as a whole is required compared with a conventional alternator of the same rating.

Because of the lower heat capacity of hydrogen compared with water or oil, the space needed by the gas-cooled coil is less than that of the liquid-cooled coil. Thus, some small reduction in overall core diameter and weight can be achieved by the use of a liquid. This possible gain is relatively small unless the current density is increased to such an extent as to result in a significant reduction in the efficiency of the machine as a whole. As it has been found possible to design for outputs up to at least 300 MW without taking advantage of this, the English Electric Co. has developed a completely gas-cooled design to keep the machine as simple as is practicable.

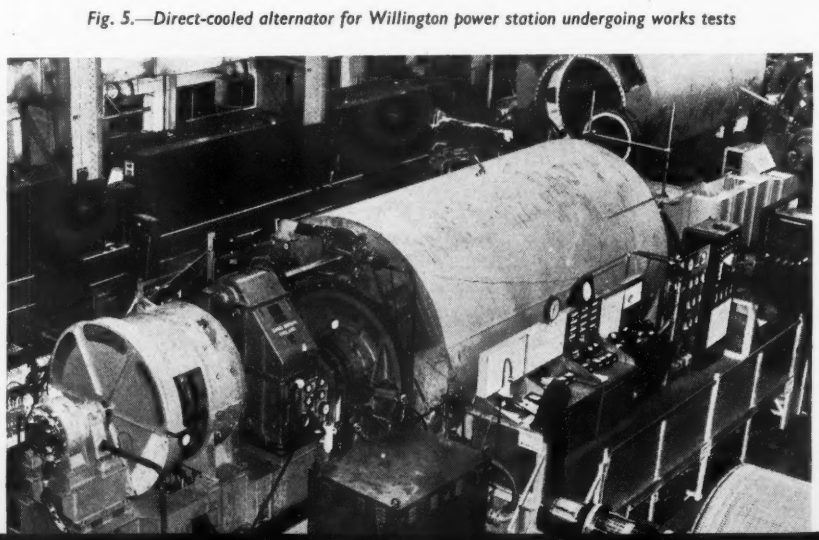
While the self-fanning action of the rotor produces a certain circulation of gas, the differential pressure available from this source is small and to obtain the benefit of the cooling system a substantial pressure boost is essential. The pressure requirements of the three main circuits of rotor and stator coils and of the stator core can readily be made the same giving the maximum overall efficiency. However, the pressure required is much higher than can be obtained from the hitherto normal axial flow fans on the rotor shaft and consideration therefore has to be given as to how this additional pressure may be obtained. Although the rate of gas circulation is low, the basic pressure of 30 p.s.i.g. and upwards together with the high differential required results in a pumping power which is significant in the total machine losses and it is therefore important that the maximum blower efficiency should be obtained.

If the blower were mounted on the main shaft the number of stages necessary would be large and the entry and exit conditions cramped and aerodynamically inefficient. Furthermore, the assembly of such a blower and the provision for sufficient axial movement of the rotating blades to allow for thermal expansion effects in the main machine would be difficult, apart from causing a substantial reduction in the first and second critical speeds of the alternator shaft due to the substantial extra length required between bearings.

In view of this the company has adopted a separate blower unit which is mounted in the upper part of the stator frame in the existing space between the two axially mounted coolers. In this position no increase in frame dimensions is necessary and a full diffuser can be incorporated on the blower outlet. The blower designer has freedom of choice as regards speed and number of stages. The drive is taken from an extra pinion on the exciter gearbox via a cardan shaft arrangement.

Cross-sections through the stator and rotor slots of a

Fig. 5.—Direct-cooled alternator for Willington power station undergoing works tests



typical machine employing the above principles are shown in Fig. 2, while a view of the end of the stator coils showing the gas ports is given in Fig. 3. The gas enters each half-coil at one end of the machine and leaves at the other. This arrangement gives a reasonable pressure drop and reduces to the minimum the differential thermal expansion between the two coil sides in a slot, and between the coils and the core.

From the illustration of the rotor end windings (Fig. 4) it can be seen that the ports for the gas to enter and leave the tubular conductors in the end turns are in the side walls. This eliminates risk of any slight relative movement of the turns which can occur in the end region, causing partial restrictions to flow if the ducts were formed in a radial direction through the conductor stack. As can be seen from Fig. 1, the gain in current-carrying capacity from raising the hydrogen pressure is considerable in the case of conductors which are direct cooled, and the trend is towards the use of pressures in excess of 30 p.s.i.g. To cater for these higher pressures it has been necessary to carry out development in connection with hydrogen shaft seals. An extensive programme of work on these was carried out using a test rig on which full-size seals up to the largest diameter visualised were tested working with hydrogen up to pressures several times greater than the maximum so far employed. The rig shaft was run with vibration amplitudes well in excess of those likely to be met with in service.

Aircraft Electrical Equipment Laboratories

NEW laboratories costing £500,000 for the development of advanced electrical systems and components for aircraft and guided weapons have just been completed at the Bradford works of the English Electric Co., Ltd. The company is designing and developing equipment for new aircraft which will fly at such high speeds that they will heat up to temperatures well beyond those of aircraft flying to-day. These and other exacting conditions which will be met by future aircraft and guided weapons can be simulated in these new laboratories.

Apart from this work, the laboratories are being extensively used for developments to improve the effectiveness of present-day aircraft. The company's Aircraft Equipment Division is now producing annually, electrical systems for 500 large and medium-sized aircraft. Most of this production is at the company's works at Thornbury and Carr Lane, Bradford, with constant speed drives being manufactured at Netherton, near Liverpool. Service facilities at these factories handle equipment returned for routine overhaul. These facilities have recently been expanded in line with the increased rate of production to ensure that equipment is returned to the operators with the minimum of delay.

When the Aircraft Equipment Division was formed in 1954, it was decided to develop constant frequency a.c. generating systems which, it was considered, would be required by large modern aircraft. At the same time, d.c. and variable-frequency a.c. systems were developed for smaller aircraft. In addition to these entire generating systems, many items of equipment made by the Division are fitted in military and civil aircraft.

One of the most important products of the Division is a hydro-mechanical constant speed drive. This unit is interposed between each alternator and the engine, and is capable of accepting the ever-varying speed from the aircraft's engines and converting this to the constant speed required for alternators in a constant frequency generating system. This ensures the stable constant frequency supply necessary for the efficient operation of radar, navigational aids and other equipment. This particular design of constant speed drive also makes possible the parallel operation of several alternators in a multi-engined aircraft.

The new laboratories have been designed to cover the development and type approval testing of the complete range of aircraft and guided weapon electrical equipment handled by the Division. One of the main facilities is a rig in which the complete electrical system of a four-engined aircraft can be assembled and operated. High-powered dynamometers simulate the aircraft's engines to provide electrical power to the system on test at precisely the same speeds and with the same variations which would be experienced in flight.

In the high altitude chambers equipment can be tested in a near vacuum similar to conditions which will be experienced by aircraft flying at altitudes well above the existing world altitude record. These chambers can simulate conditions, including temperature and humidity, at all altitudes from sea level to 90,000ft. In the pan-climatic chambers equipment can be subjected to tropical conditions and the effect of fungus growth can be studied.

In the vibration laboratory, equipment is subjected to both "search" and endurance tests to ensure that no component is liable to fatigue failure in service. In general, far greater stresses are applied than could be encountered in service, and equipment is taken through the full range of vibration frequencies from 10 to 500 c/s, lasting up to 200 hr. One vibration table is portable so that control equipment can be separately vibrated whilst wired into an aircraft system set-up.

High capacity 30 V d.c. and 400 c/s a.c. is available in every laboratory. In the case of 30 V d.c. the voltage can be regulated at the particular point of use by a portable regulator. Certain laboratories also have 112 V constant current. Portable power supplies are available where independent control is essential. These include mobile 9 kW 30 V d.c. mains operated motor generating sets and mobile 9 kVA, 200 V three-phase 400 c/s sets.

Dynamometer control room in the new English Electric laboratories

Printed Microwave Circuits

By J. M. C. DUKES, M.A., D.I.C., A.M.I.E.E.

DURING recent years considerable effort has been devoted to reducing the cost, bulk, and weight of microwave circuits, a trend which has been accentuated by a continual increase in their complexity. Indeed some of the systems proposed would appear hardly practicable but for the drastic improvements made. The problem has been tackled in a number of ways, most of which rely on improved manufacturing techniques, e.g. casting, electroforming, automative tooling and the adoption of lightweight alloys. A further improvement can be obtained if the complete circuit is manufactured in the form of a single block instead of an assembly of isolated components. A more radical approach, however, has led to the consideration of several less conventional transmission systems as an alternative to hollow rectangular waveguide. Of these perhaps the most promising is the so-called strip transmission line of which now several varieties exist. Compared with conventional hollow waveguide the cross-section is generally smaller, the materials are inherently lighter, and the geometry facilitates production by printed circuit techniques.

Fig. 1 shows the basic conductor configurations for the three principal types of strip transmission line. Superimposed on each cross-section is a sketch of the lines of electric force for dominant mode transmission. The three lines are equivalent respectively to open-wire balanced-pair, wire-above-ground, and coaxial cable. It

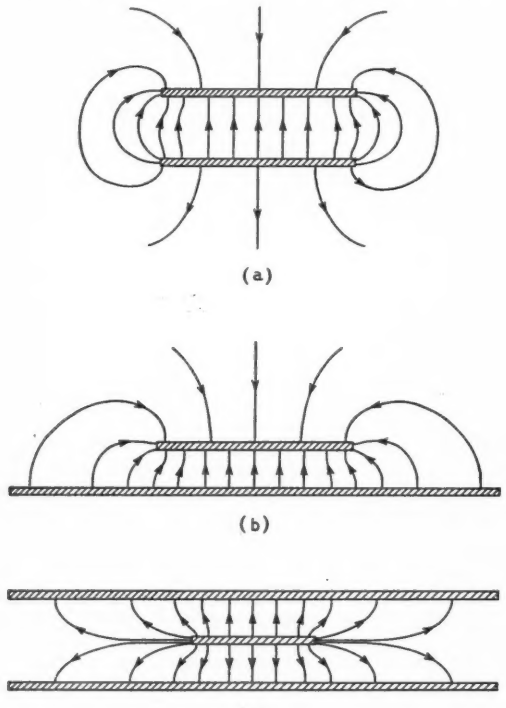


Fig. 1.—Geometries of the three principal strip transmission lines (a) Balanced line. (b) Strip above ground. (c) Triplate

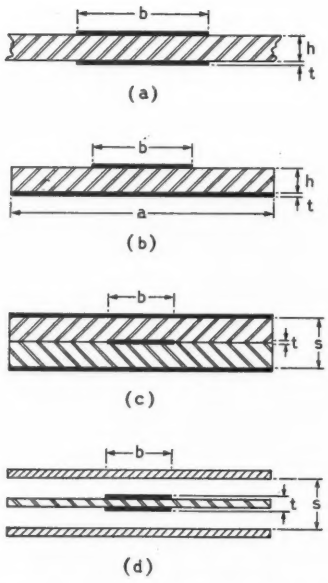


Fig. 2.—The four practical types of strip transmission line (a) Balanced line. (b) Microstrip. (c) Triplate. (d) High-Q triplate

follows that there is no lower cut-off frequency (unlike hollow waveguide). The inductance and capacity per unit length and hence the characteristic impedance have been calculated by a number of authors and the results have been summarised in an earlier paper. The air-supported lines are of little practical interest, and one or other of the forms illustrated in Fig. 2 is more usually employed. The introduction of a material having a dielectric constant different from that of free space will, of course, modify both the characteristic impedance and also the velocity of propagation, and this must be taken into account in designing components. The effect is greatest for Fig. 3 (c), since virtually all the field is contained within the dielectric material, and least for Fig. 3 (d) where the material is situated in a region of low field strength. The triplate line is therefore particularly well suited to the design of low-loss circuits such as filters. Figs. 2 (a) and (b) represent an intermediate condition which is rather difficult to analyse. The author has achieved an approximate solution illustrated graphically in Fig. 3; an examination of these curves reveals that the impedance falls by somewhat less than $(\epsilon_a/\epsilon_d)^{\frac{1}{2}}$. It should be noted, however, that these data are reliable only when the dimension h is a small fraction of an electrical wavelength. As h approaches a half-wavelength the wave changes its character, and at the same time radiation from the line reaches significant proportions.

Trial of a number of different printed circuit techniques showed the so-called photo-mechanical method to be best as it provided the essential high definition and dimensional stability. A laminated board of some high-grade material, such as polytetrafluoroethylene impregnated Fibreglass, is generally employed (tan $\delta \approx 0{\cdot}0007$).

Summary by the author of three papers, "The Application of Printed Circuit Techniques to the Design of Microwave Components," "Broad-Band Slot-Coupled Microstrip Directional Couplers" and "Re-Entrant Transmission Line Filter Using Printed Conductors," presented to the Radio and Telecommunication Section of the Institution of Electrical Engineers on 13th November.

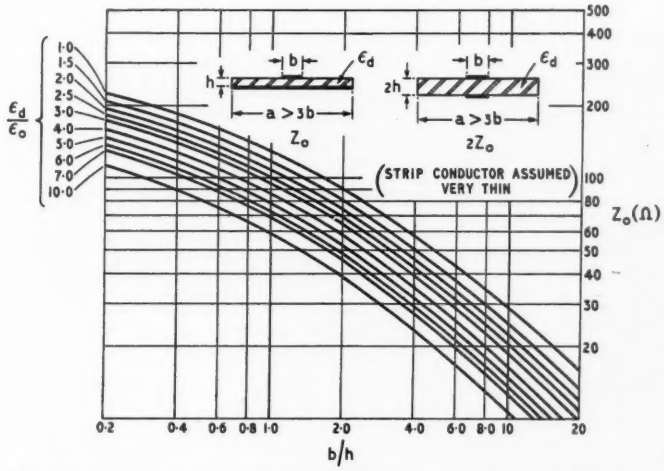


Fig. 3.—Characteristic impedance of microstrip and balanced line (Calculated by the method described by the author in an earlier paper (Proc. I.E.E., Vol. 103, Pt. B, No. 9, May, 1956, p. 319))

The board, usually $\frac{1}{16}$in thick, is supplied clad with copper foil, 0·0014in thick, on both sides. The circuit is produced by splashing the board with an etching solution such as ferric perchloride, the foil to be retained being protected by a photographically deposited "resist." Using this technique, complicated components can be printed with a dimensional accuracy of between 0·0001 and 0·001in. This is at least one order of magnitude better than the tolerances on thickness and electrical properties of the Fibreglass board. With the exception of perhaps Fig. 2 (d) it is therefore the properties of the laminate which provide the principal limitations on electrical reproducibility.

The technique of designing components in strip transmission line form does not differ radically from that employed with conventional waveguide systems. The calculations of circuit proportions are, however, somewhat more difficult, and certain special precautions are at times necessary to prevent radiation or propagation in modes other than that intended. In general, the performance is slightly inferior to waveguide, particularly in respect of dissipative losses, but this is often more than offset by other advantages; not only is the strip-line circuit smaller, lighter and cheaper to produce, but the operational bandwidth is considerably wider than that usually possible with rectangular waveguide.

Several examples are illustrated in Figs. 4 to 6. The first is a directional coupler using two lines of the type illustrated in Fig. 2 (b), mounted back to back. Energy flowing along one of the transmission lines is coupled into the second line through a series of slits in the common ground plane. The size and number of the slits determine the magnitude of the energy transfer, whilst the manner in which the slits are distributed determines the directivity. In the forward direction the contributions from the individual slits tend to add, whilst in the reverse direction the contributions tend to cancel. For the design shown, which has a mid-band frequency of 3,500 Mc/s, exactly half the energy incident on the first line is coupled into the second line; of this coupled energy all but about 1 per cent continues to travel in the same direction as the incident wave in the first line. Considered as a four-terminal pair network the directional coupler is an exact analogue of the telephone hybrid coil, and therefore finds application in

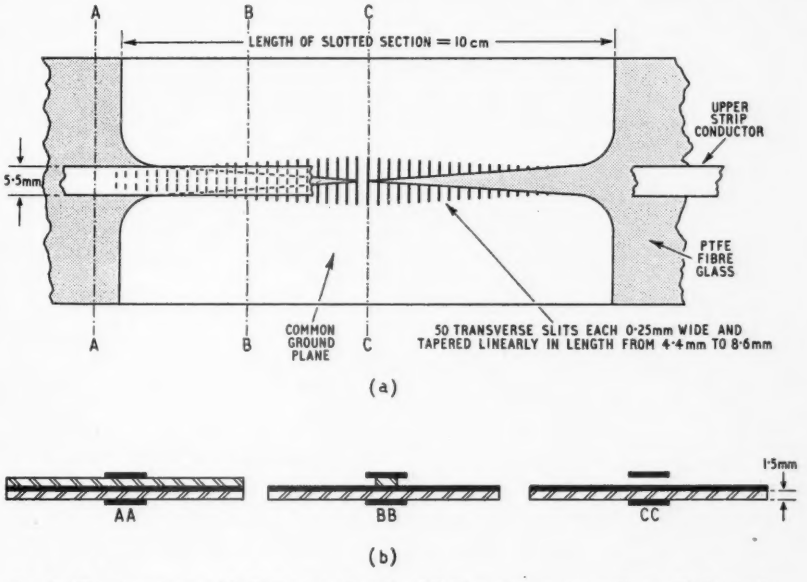


Fig. 4.—Phase-compensated 3 dB directional coupler (a) Plan view, upper surface. (b) Successive cross-sections

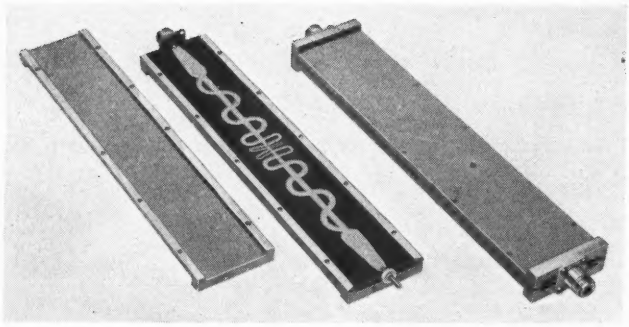
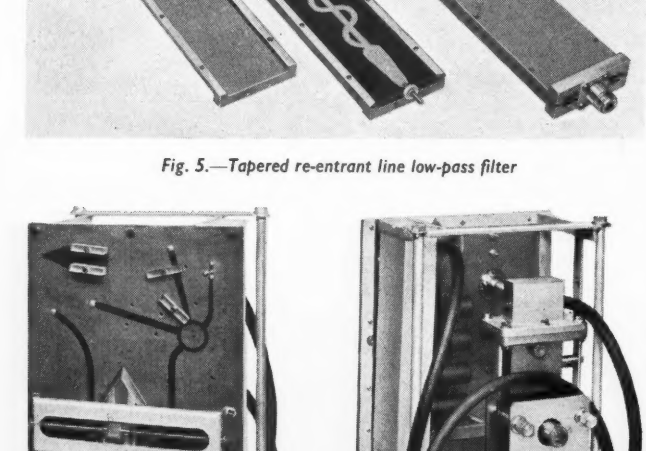


Fig. 5.—Tapered re-entrant line low-pass filter



Figs. 6a and 6b.—Microstrip duplex working r.f. head

similar types of circuit. An additional refinement is the manner in which the cross-sectional area of the dielectric sheet in the upper line is tapered over the length of the coupled section so as to provide a graded variation in phase velocity. Properly utilised, this permits a considerable improvement in the usable bandwidth which in the present instance approaches 1·6 : 1.

Fig. 5 shows a new type of low-pass filter using the high-Q triplate line of Fig. 2 (d). The filtering action is obtained by virtue of recurrent interference between two transmission lines which repeatedly intersect along the length of the filter. No other elements are involved, and the design therefore lends itself particularly well to the printed circuit technique. The properties of the particular design may be summarised as follows:—

Overall length: 12½in.

Passband insertion loss: average ½ dB (2,500 to 4,050 Mc/s).

Cut-off frequency: 4,050 Mc/s.

Sharpness of cut-off: attenuation rises 40 dB between 4,050 and 4,150 Mc/s.

Stop-band insertion loss: greater than 30 dB (4,150 to 12,000 Mc/s).

For a small batch of these filters reproducibility was found to be better than ±½ dB over the range 2,500 to 4,100 Mc/s, i.e. up to a frequency just above the cut-off frequency.

The final example, Fig. 6, shows the r.f. head of a duplex working transmitter-receiver developed for use in the testing of the propagation characteristics of a radio path prior to the installation of a complete microwave link. The unit is normally enclosed in an hermetically sealed can and mounted just behind the parabolic antenna at the head of the mast. It comprises a microstrip panel, behind which is mounted a tuned cavity containing the oscillator valve, an i.f. pre-amplifier, a filament transformer, and a length of coaxial cable which forms part of the r.f. circuit. The microstrip panel comprises two "rat-race" type hybrid junctions, an adjustable phase-shifter (consisting of a slab of polystyrene which may be slid across one or other of the two long strip conductors), an adjustable flap type attenuator, a matched load (carbon-backed card), two tuning elements and a crystal detector which projects backwards into the i.f. pre-amplifier. The function of this panel, in conjunction with the coaxial cable, is to separate the incoming and outgoing signals which differ in frequency by 60 Mc/s (i.e. by the intermediate frequency). On transmission the oscillator is frequency modulated by the outgoing speech signal, and on reception the oscillator acts as the heterodyne signal source for the receiving circuits. The unit occupies about two-thirds the volume of the original waveguide unit, and is significantly easier to tune and operate.

In conclusion it can be said that the technique shows notable advantages in respect of cost, weight and bulk, but at the expense of a slight degradation in performance. Because of the limited power-handling capacity the possible applications exclude the important field of high power radar systems. There is also some question as to how materials such as p.t.f.e. Fibreglass will stand up to conditions of extreme humidity, though this should not prove a problem if the equipment is hermetically sealed. Perhaps the biggest handicap to any extensive application to date has been the relative lack of knowledge and experience. In addition the measurements as well as the technique of mathematical analysis are inclined to be more involved. These limitations will gradually be overcome and there seems little doubt that the strip transmission line technique will then find fairly extensive employment in certain restricted fields of application.

International Exchange of Students

IN the tenth annual report of the International Association for the Exchange of Students for Technical Experience (I.A.E.S.T.E.) detailed information is given relating to the 5,934 students exchanged in 1957. Since the foundation of I.A.E.S.T.E., 34,602 students have been exchanged and provided with practical or commercial training. The report states that the increase in the number of students exchanged during 1957 was small compared with many seasons in the past. In several countries the exchange has developed so fast that any further considerable increase cannot be expected, but in other countries it is felt that there will be scope for making a better contribution to the exchange when certain outstanding internal administration problems have been solved.

The first issue of a handbook on "Vacation Training" published by the Imperial College of Science and Technology (University of London) is also now available. One of the objects of the Imperial College Vacation Scheme is to provide undergraduates of the universities and colleges affiliated to I.A.E.S.T.E. (G.B.) with practical experience abroad under the sponsorship of the Association.

Engineering in Europe

ABSTRACTS FROM FOREIGN TECHNICAL JOURNALS

IT is a well-established fact that the existing types of thermal overload protection of transformers based on oil thermometers are too inert to be of much use in cases of overheated windings. This is because the time constant of the bulk of the oil filling is far too large to enable any overloading of the transformer to be quickly indicated. Furthermore, ammeter readings are not reliable in this respect, because no inference on instantaneous winding temperature can be drawn from them. This depends in the last resort on the temperature gradient copper-oil-ambient air. That is why transformers possess remarkable overload margins at low ambient temperature, which must be fully utilised, particularly since the highest load peaks of distribution transformers mostly occur during the cold season.

An obvious idea, originally conceived by K. Tauber, is to use the oil filling as a whole as thermometric liquid and to measure its pressure by precision manometers inserted into the connection between tank and conservator. However, even such a manometer enables only the total, i.e. static and dynamic oil pressures to be read and therefore tells only part of the story. It has to be supplemented by an instrument for the dynamic pressures, and this takes the simple form of a calibrated diaphragm (orifice meter), also placed in the pipe between tank and conservator. This combination conveys an idea of the actual loading and the " reserve " of overload capacity left at any instant. Furthermore, it will indicate coils or parts of windings which may have worked loose and constitute a danger not detectable by other means. Lastly, this protective device can be structurally combined with a Buchholz relay. —" A Protective Device for Oil Transformers," W. May, *Elektrizitatswirtschaft,* Vol. 56, No. 5, pp. 158-160, 5th March, 1957, in German.

Impulse Strength of Insulators

Attention is called to the considerable discrepancies between the results of 50 per cent flashover voltage and impulse withstand tests on insulators of either the same type and size, or of various sizes of the same kind of insulator. Even the dispersion of successive test results obtained on the same specimen is surprisingly large. This is quite apart from the well-known differences between dielectric strength under negative and positive impulse waves.

Since it is difficult to find a physical explanation of this phenomenon, the author assembled a great number of test results obtained on a large variety of insulator types and, partly, on the same types and even specimens, and subjected them to statistical evaluation. Although a physical interpretation of the discrepancies, and even of their varying orders of magnitude (for single specimens between 1 per cent and 14 per cent, and for different specimens of the same type and size between 1·5 and 8 per cent), was not obtainable in this way, the important conclusion reached by the author is that tests of the impulse withstand strength of insulators should be carried out by applying 100 impulses of every step of the voltage scale to the specimen considered (equivalent to 0 per cent discharges for 100 impulses). This is the only way of obtaining reproducible and reasonably certain dielectric strength values.—" Impulse Withstand Strength in Tests on Insulators," C. de Bernochi, *Energia Elettrica,* Vol. 34, No. 7, pp. 681-691, July, 1957, in Italian.

Telephone Interference

These two papers were read at a special meeting on telephone interference, Berlin. The author of the theoretical paper examines the basic assumptions of the accepted theory (Benda) and shows them to be inconsistent with physical facts, particularly because the earth currents, which are obviously the main source of danger in the case of earth faults on transmission lines, are not considered. The analysis is then improved by considering earth currents and the correct expressions are found for e.m.f.s and currents in cores and sheaths. An application of the corrected theory is made to communication cables in power stations and substations and the complex reduction factor derived is discussed in its effect in various possible cases.

The second (experimental) paper reports the results of a comprehensive series of measurements carried out on three communication cables, one of them specially protected, near their entry into a transformer station. Artificial earth faults with sustained fault currents of 50-150 A and intermittent (impulse) fault currents of 700-1,100 A were produced and the potential of the substation artificially raised by insulating the earth wires on the nearest masts against the latter. Supplementary measurements were made of the potential distribution and resistances to earth in the substation area. The latter were very favourable because of the very humid soil ($r<0{\cdot}24$ ohm). Upon the whole, the experimental results show that the dangers of incompletely protected cables are much greater than the calculations indicate and that satisfactory protection requires the resistance of the screening sheaths to be really low. Summaries of six other papers read at the meeting and published in other journals, are included.—" Theory of the Telephone Interference on H.V. Lines," E. Wedemeyer; " Measurements of the Interference on Telephone Cables near Lead-ins to Transformer Stations," R. Baranowsky, *Dtsch. Elektrotech.,* Vol. 11, No. 5, pp. 212-215; pp. 215-220, May, 1957, in German.

Transformer Temperature Rise

Although well-designed large transformers have nowadays efficiencies of the order 99·4 per cent, and even more, the $\sim$0·6 per cent lost can be an economically appreciable figure (e.g. 750 kW in the case of a 125 MVA transformer). This percentage loss can still be reduced by adopting sounder transformer designs considering effective heat dissipation, and by the use of up-to-date cooling arrangements, preferably with artificial ventilation and forced oil circulation. High duty coolers with smooth circular, rectangular and fin-type air pipes are considered. The method of designing the cooler and determining the required fan and oil pump ratings for given maximum temperature rises is explained and modifications in the calculation necessitated by different designs and con-

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review.*

figurations of the transformer insulation are also discussed.

The influence of oil inlet and outlet temperatures and cooling air velocities on cooler efficiencies are illustrated by diagrams obtained theoretically and confirmed by measurements. The comparison of the obtainable transformer output when only part of the fans are working with that when all the fans are in operation is very revealing. The final section of the article examines how far the existing regulations on transformer operation can be complied with by economic means, where permissible over-temperatures are concerned. — "Problems of the Temperature Rise of Large Transformers," W. Blankenburg, *Dtsch. Elektrotech.*, Vol. 11, No. 5, pp. 204-211, May, 1957, in German.

Installing Cables in Ducts and Pipes

The installation of cables in ducts and pipes is becoming fairly general nowadays, the first being preferred for h.v. and local communication cables, the second for e.h.v. cables. While the principle of the introduction of the cable into the piping or ducting is simple enough, viz. by a winch and a rope threaded through the pipes or ducts already *in situ*, obvious difficulties arise from the friction forces between cables and ducting or piping, particularly where the geometrical configuration of the latter deviates from straight lines. There are all kinds of simple and composite bends in these buried structures, and the friction forces to be overcome will depend on the type of bends as well as on the mechanical characteristics of the cables, above all, flexibility and surface condition (the latter, in turn, on the cable type, armouring, if any, etc.).

It should be remembered that the most important value to be known is not the minimum force required to get the cable through the duct or pipe, but the maximum force compatible with the mechanical strength of the cable materials, to avoid damage to the cable. The known methods of calculating the pulling forces are unduly complicated and laborious, so that the author's simplified method represents a real advance in this field. It is based on the use of "geometrical friction coefficients," for which analytical expressions have been derived taking account of any type of simple and multiple bend likely to be encountered in cable-laying operations. For convenience, numerical values of these coefficients have been calculated and graphed for speedy determination; a comprehensive table collects all the shapes and data required in every special case. The numerical example worked for a special case illustrates the simplicity and expediency of the method.—"Simplified Method of Calculating the Pulling Forces for the Installation of Cables in Ducts and Pipes," M. Marsal, *Elektrotech. Obzor*, Vol. 46, No. 6, pp. 295-302, 1957, in Czech.

Insulator Flashover

Under normal atmospheric conditions the extraneous layers on insulators are only of molecular dimensions, i.e. 10^{-7} to 10^{-5} cm, and remain comparatively dry. Critical conditions arise if the layer thickness reaches the order of 10^{-3} to 10^{-2} cm, since the surface resistance is then very considerably reduced. An "igniting" discharge may be followed by a glow arc which turns at a certain current density into a genuine arc-over of part of the insulator surface. The roots of such arcs are at a high temperature and may dry the surface layer locally (for this reason the phenomenon is known as "drying discharge").

However, the electrodynamic and lift forces and the vapour pressure acting at the arc root are sufficient to produce in the neighbourhood of the arc atmospheric conditions resulting in a re-moistening of the layer as soon as the arc root has moved on (arcs are in perpetual movement). The migration of the arc extends over several half-periods, the average speed taken over one half-period exceeding that taken over several of them. At last the partial arcs are united by flashovers between the plasma channels. The specific flashover voltage between these heated "gas electrodes" is $u_{max} \sim 6$ kV/cm.—"Flashover on Extraneous Layers and Migration of the Arc Roots," W. Frischmann, *Dtsch. Elektrotech.*, Vol. 11, No. 7, pp. 290-295, July, 1957, in German.

Compensated Synchronous Condensers

When the steady-state stability of long transmission systems is improved by synchronous condensers placed in intermediate substations, the rating of the synchronous condensers required may be reduced by static series capacitors connected to them. The permissible percentage of compensation depends on the condenser design and the system characteristics. With increasing ratio of equivalent system reactance to transient reactance of the condenser (including transformer), the permissible percentage of compensation also increases. Tests on a system model with synchronous condensers have clarified some important related problems, particularly those of self-excitation and hunting, and also the beneficial effect of a compensation of the condenser reactance on the transient stability of the system.

Compensation by static capacitors or a non-controlled synchronous condenser raises the transient-stability limit of the power transmitted. If a synchronous condenser, rated for 30 per cent of the power transmitted, is provided with an automatic excitation control, the power transmitted is increased by 10 per cent as against the case of a non-compensated condenser without such control. These results are not claimed to fully exhaust the problem, but they are promising enough to stimulate further investigations on other aspects of it.—"The Problem of the Use of Compensated Synchronous Condensers," V. A. Venikov and D. A. Fedorov, *Elektrichestvo*, No. 9, pp. 10-13, 1957, in Russian.

Impulse Test Measurements

The h.v. cathode-ray oscillograph is indispensable in impulse testing and the ultimate decision will probably forever rest with it, despite the fact that certain relevant information concerning surge phenomena can be obtained more conveniently and rapidly by other instruments. Peak voltmeters of various designs have lately been introduced in many testing stations and have partly displaced the conventional sphere gaps which, it is true, have the advantages of simplicity and ease of control. However, it is in the nature of spark discharges that they cannot be used to yield a well-defined value of a breakdown voltage, but only a statistically-founded 50 per cent breakdown value.

Where measurements of partial or secondary voltages in windings and transformers, current measurements, indications of polarities, etc., are concerned, the c.r.o. has no rival, that is, if the required auxiliaries such as voltage dividers, delaying cables, etc., are also reliable enough. Often the insertion of simple auxiliary set-ups, for example, resistors shunted by spark gaps, into the leads to and from the tested object will furnish valuable preliminary indications supplementing oscillograms. These general considerations are illustrated by a discussion of typical results of transformer impulse tests.—"Measuring Methods in Impulse Testing," B. Gänger, *Bull. Assoc. Suisse Elect.*, Vol. 48, No. 18, pp. 809-813, 31st August, 1957, in German.

INDUSTRY AND THE HOUSE

Thoughts and Action on Inflation

By A. M. F. PALMER, A.M.I.E.E., M.Inst.F., M.P.

FOR three months, since the last days of July, the sombre chambers and corridors of the Palace at Westminster were empty of Parliamentary occupants; all was given over to the vacuum cleaner and the tools of the mason, carpenter and electrician. But now in autumn, with lamp-lit evenings outside in Parliament Square, members have returned to take up economic matters again, but not quite where they left them.

Inflation was bothering rank and file M.P.s in the summer; now the news of its menace has reached the highest places. Hence it was not inappropriate that the two or three days before the prorogation should have been given over to a general debate on the economic position. The main speakers were Mr. Harold Wilson, usually regarded as the certain Opposition candidate for the Treasury, and the present incumbent, Mr. Peter Thorneycroft, the Chancellor of the Exchequer. After making a general statement on investment which included " re-phasing " the nuclear power programme (an interesting euphemism for a cut), the Chancellor moved boldly to his main theme. Hitherto, perhaps with a commendable anxiety to prove that a Conservative Government could get on as well with the trade unions as a Labour Government, Ministers have been reluctant to speak plainly on the matter of incomes and prices. There would be some who would say indeed that in the Monckton days the Government leaned over backwards to give no offence to organised labour. However, gritting his teeth, the Chancellor now argued that wage increases going far beyond the real wealth of the country were the greatest danger the nation had to face at present. Any large mistake by those claiming, granting or adjudicating on wage increases could also be a disaster.

Need for Increased Production

Much, of course, of this would be accepted by all the major political parties; Mr. Thorneycroft is saying to-day what Sir Stafford Cripps used to say ten years ago—money by itself loses value unless accompanied by an increased production of goods and services that everybody wants. But in politics, which are a compound of reason, interest and emotion, nothing ever stops at a plain statement of fact. The Opposition has much to add to the account; the Labour Party is convinced that the Government's " free for all " outlook over the last few years is just as much to blame for present difficulties as increased incomes; it is common for Opposition propagandists to claim that the policies of removing subsidies and whittling away rent control have encouraged wage demands. Also, Labour believes that Mr. Thorneycroft may be one thing but Lord Hailsham is quite certainly another. On this last point Mr. Wilson in the debate contended that trade union co-operation was an asset that every Government should welcome; such co-operation could hardly come about if prominent politicians like the Lord President of the Council were talking seriously of a " show down " with the trade unions.

To Mr. Wilson's warnings some Conservative back benchers had a ready reply. Mr. Angus Maude and Sir Ian Horobin are Conservative right-wingers; able men and forthright in their view that a Conservative Government should pursue Conservative policies. Sir Ian prophesied, for instance, that if the Chancellor allowed the trade unions " to get away with it " it would produce a political situation which would make the Gloucester by-election result look like a unanimous vote of confidence in the Government. Mr. Maude thought that there had been a conspiracy between management and workers to let costs rise and to pass the consequence on to the consumer in higher prices. The soundest basis, he thought, on which to meet the problem of internal inflation was a moderate deflation; " deflation " is a daring word which until recently careful politicians have avoided using.

Although the push and pull of political forces in the House may be a little tedious to the outsider, I think this controversy, even if it takes the sharpest party forms, is of value because it is blowing away what can all too easily develop at Westminster—a complacent atmosphere of " everything is for the best." Even if there is exaggeration and an occasional unfair imputation of motive, much plain truth and hard fact is being deployed. The result will in the end I am sure make for clarity of thought in the mind of the public, of whom trade union members these days are a considerable section.

Whitley Council Decision Veto

After a short break and the opening of the new Session by Her Majesty, debates have again been resumed with acrimony, aggravated by the unprecedented action of Mr. Derek Walker-Smith, the Minister of Health, in vetoing a unanimously agreed decision of a Whitley Council in the Health Service. On the assumptions that have hitherto governed theory and practice in British collective bargaining, it is not easy to defend the intervention. For negotiations to be successful and the outcome to command general respect, the two " sides " must feel about each other that they are men of substance whose word, once given, is a binding commitment. For employer representatives to be disowned later by a higher authority which had no part in the original discussions would soon make negotiations a sham. It is also a little unfortunate that the employees concerned are small salaried people who have probably suffered much already from price rises.

Although there is an obvious difference between the Health Service monies found from general taxation and the trading revenues of the nationalised industries, the unions who organise workpeople and staff in nationalised industries are bound to wonder if this means an end to negotiating practices which, on the whole, have made for peace and stability. Time only can supply the answer; the Prime Minister and other Ministers have certainly been at some pains since to assure everybody that, provided no extra governmental credit is involved, state industries will remain free to make their own decisions in wage and salary increases as in other matters.

I think the delicacy of the situation is now realised by the Prime Minister for there are signs that the Government's attitude is turning away from its earlier inflexibility. Equally, the Opposition—mindful no doubt of

what it would have to face if it came into power—is careful also not to seem to take up a provocative stand.

In the Queen's Speech there was not a great deal of direct industrial interest so far as legislation is concerned. There is certainly nothing at all resembling the Electricity Bill of the last session. But as an aspect of general policy the Government proposes to organise a Commonwealth Trade and Economic Conference in 1958. A pledge is given as well that it is still the firm purpose of Ministers to seek to bring negotiations for a European Free Trade Area to a successful conclusion.

For legislation and divisions this may prove to be the easiest session of the present Parliament, but for controversy it is likely to be more than lively. The General Election has crept a year nearer; everything is being done, consciously or unconsciously by honourable Members, to present to the public the most favourable face that the parties can find.

Museum Lighting

ARTIFICIAL lighting as applied to museums and art galleries was the subject of a paper by Messrs. W. E. Rawson-Bottom and J. B. Harris presented to the Illuminating Engineering Society recently. They said museum and art gallery lighting has evolved during the past hundred years and that research has revealed that the pioneer work was remarkable for the appreciation of the problems involved and for the ingenuity displayed in their solution. Since those early beginnings this particular application of artificial light, like all others, had seen many changes, but for some twenty-five years, at the beginning of the century, little development was evident. An impetus was given just after the first world war by the introduction of gas-filled lamps. These made the optical control of light a possibility, enabling a comparatively large area of wall surface to be illuminated from a single source. In those days it was considered an achievement to provide a value of 3 to 4 lm/ft^2. This low value of illumination coupled with the indifferent colour rendering obtainable at the time was insufficient to reveal the subtleties of colour and texture which for the true appreciation of art is essential.

During the last decade the research and development that has gone into finding the ideal solution to the problem of art gallery lighting had been considerable and some good results had emerged. One example was the lighting of the new air-conditioned rooms in the National Gallery, where the artificial lighting had been successfully merged with the architectural features. It had been said of this scheme that the appearance of these rooms and pictures at night was comparable to daylight—which was a tribute. The method employed may well set a standard in design or at least be a guiding principle in the future.

Museum lighting had also been the subject of much development, especially during recent years. This had been due not only to the desire to keep pace with the increase in illumination that was being demanded generally but, what was more important, museum authorities were appreciating the value of this essential aid to display. Here again it was the introduction of a new light source that made some of the present-day museum lighting possible. Internal lighting of showcases was not a practical proposition until the fluoresecnt lamp came into being. It was now usual for modern showcases to be designed to accommodate internal lighting suitable for the particular exhibits they were to contain. Even with the comparatively cool running of these lamps, heating problems occurred and those could now be largely overcome by incorporating a ventilation system which did not affect the exhibits.

Electrical Industries Ball

AS usual, the annual ball organised by the Electrical Industries Benevolent Association was a very successful affair. Over a thousand people assembled at Grosvenor House, London, W.1, last Friday and after dinner there was dancing and a cabaret.

During dinner the president, Mr. J. S. Pickles, announced that a telegram of loyal greeting had been sent to Her Majesty the Queen, patron of the Association, and a reply had been received. Mr. Pickles also said that of the extra £15,000 which it was hoped to raise this year, £6,000 had already been assured.

Over fifty prizes, many of considerable value, were presented by leading electrical concerns and allotted to holders of programmes. The sale of programmes (which were provided by the A.E.I.) brought in £566 and a collection taken during the evening realised £318; altogether the E.I.B.A. funds will benefit to the extent of £1,950.

Music was provided during dinner by the Entr'acte Players and for dancing by Sid Phillips' Orchestra. The cabaret consisted of Boscoe Nolden and his Caribbean Dancers and Robert Harbin (magician).

At the reception : The President and Mrs. J. S. Pickles greeting Mr. and Mrs. Trehear ; Mr. and Mrs. C. T. Melling ; and Mr. and Mrs. A. L. G. Lindley

Some of the Company at last Friday's Ball

1. *The company at the President's table includes Sir Henry and Lady Self, Mr. and Mrs. J. Henderson, Mr. and Mrs. J. I. Bernard, Sir Charles and Lady Cunningham, Mr. and Mrs. C. T. Melling and Mr. and Mrs. J. P. Tucker.* **2.** *Another view of the President's table, including the President and Mrs. Pickles and Mr. and Mrs. W. Allan Smith.* **3.** *In this photograph are Mr. and Mrs. W. M. York, Mr. and Mrs. C. B. Cleland, Mr. and Mrs. K. G. S. Croft, Mr. and Mrs. R. G. Chinn and Mr. and Mrs. R. D. Bowtle.* **4.** *Group including Mr. and Mrs. R. W. Holledge, Mr. and Mrs. N. L. Russell, Mr. and Mrs. E. H. Maltby, Mr. and Mrs. P. Wetherill and Mr. and Mrs. W. Taylor.* **5.** *An E.C.A. table: Mr. and Mrs. L. C. Penwill, Mr. and Mrs. V. J. Stock and Mr. and Mrs. H. S. Wathes.* **6.** *This group includes Mr. and Mrs. C. R. King, Mr. and Mrs. W. Lewis Smith, Mr. and Mrs. C. F. Boyes and Mr. and Mrs. S. B. Warder.* **7.** *Mr. H. S. Fothergill (secretary, E.I.B.A.) with Mr. and Mrs. F. E. C. Miller, Mr. C. A. Davis, Mrs. R. E. M. Jordan, Mr. and Mrs. R. T. Bucknell and Mr. H. St. J. de A. Donisthorpe.* **8.** *Mr. and Mrs. O. Pawsey, Mr. and Mrs. J. H. Campion, Mr. and Mrs. A. B. Wildsmith, Mr. and Mrs. J. J. Thompson, Mr. and Mrs. E. J. Counter and Mr. and Mrs. E. B. Sawyer are among this group.* **9.** *Mr. and Mrs. Luther Hall and guests.* **10.** *At this table are Mr. and Mrs. H. H. Mullens and Mr. and Mrs. E. R. Wilkinson*

VIEWS on the NEWS

By REFLECTOR

IT has recently been suggested in *The Times* that the case for the development of nuclear energy has been overdone and that "conventional" sources of power are quite capable of satisfying the needs for some years. Mr. A. M. F. Palmer, M.P., has challenged this assumption in a letter pointing out that it is a fallacy to assume that because there may be possible cheaper sources than electricity the nuclear programme is less urgent. Nuclear power is not merely required to fill a gap; it must be regarded as an additional prop of our national existence as an industrial power. He thinks that:—

> "Since the nuclear energy contribution—unlike coal or gas—must of necessity be made through electricity, eventually the whole of electric power might conveniently be produced by this means, leaving coal and oil to sustain their own special burdens."

After a reference to the fact that the provision of steam stations for the burning of small coal is being proceeded with, Mr. Palmer, backing up the opinion already expressed by the *Electrical Review*, says that reduction of expenditure on nuclear stations may be necessary in present difficulties, "but it should be clearly understood that this means taking a considerable risk with our industrial future."

* * *

The incursions of Col. B. H. Leeson (B.E.A.M.A.) into the field of parody are well known and much enjoyed. One of his latest was at the B.E.A.M.A. Publicity Conference luncheon last week when he presented the following:—

"Hey diddle diddle, the cat and the fiddle,
The cow jumped over the moon,
The little dog laughed to see such sport
And said 'I'll be doing that soon.'"

* * *

Although it can only be considered a freak, the reception in the United States of B.B.C. television transmissions is undoubtedly an interesting occurrence. There are, however, some people in this country who will wonder why the Americans are bothering about it as they are more likely than not to pick up programmes which originated with them some time before.

* * *

It appears to me that a recent decision of the Kempston Urban Council was a little high-handed. According to the *Bedfordshire Times*, the Council decided that the tenants of its houses might install immersion heaters and it gave "permission" to the Eastern Electricity Board to canvass the residents. It was later reported that some of the tenants had placed orders for immersion heaters with a Birmingham firm and that these tenants had been canvassed without the Council's permission. The Housing Committee decided that permission should not be given to the firm and that it should be asked to refund deposits paid by tenants. The firm subsequently asked for permission to canvass but the Committee considered that this should not be given "in view of the fact that canvassing had been done without permission." Of course the houses are the Council's property but the tenants are not and they should be allowed to go where they like for their immersion heaters, provided the equipment is sound and properly installed.

* * *

The Glasgow *Daily Record and Mail* reported that the Duke of Edinburgh would be "the last V.I.P. to see inside the heart of Britain's 'magic pot' atomic energy plant nearing completion at Dounreay, Caithness." The report went on to say:—

> "When the 'magic pot' is switched on early next year, the effect will be similar to that of a housewife who stokes her fire with a bucket of coal then finds two buckets of coal instead of one of ash in the grate."

This is a pretty simile but rather hard on the National Coal Board.

* * *

Depression has come to the mining village of Edlington (Yorks), not because of any falling-off in the demand for coal, but because of the erratic supply of electricity from the local colliery. In the evening, according to a report in the *Manchester Guardian*, television sets fail to work properly with the result that the people do not know what to do and, if one of them is to be believed, they simply go to bed at 8 p.m. It is a measure of the hold which the service has on the villagers when a local television engineer says:—"People here live for their sets. Take it away from their houses and you take away their lives." The report says that "the villagers probably exacerbate the trouble by overworking electric lights and washing machines," which suggests that there are other activities in Edlington in the evening—but how does one "overwork" electric light? But soon all will be well, for it is said that the Yorkshire Electricity Board is going to the rescue.

* * *

Fifty years ago electricity supply was still in its infancy and apparently suffered frequently from teething troubles. Such must have been the case at Monmouth for the *Electrical Review* of 15th November, 1907, reporting a Local Government Board inquiry into an application by the Corporation to borrow £10,000 to defray lighting expenses incurred, said:—

> "It was admitted that certain work had been done two or three times over, and money had been paid without proper investigation. It was stated that money had been paid on the certificate of the engineer, but the officials could not show how the expense had been incurred. Cables for electricity had been laid in certain streets, though no customers were forthcoming, and the cables had to be taken up again. The Inspector described it as extravagant waste, and said it was no wonder the undertaking did not pay on such lines."

PERSONAL AND SOCIAL

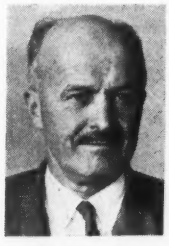
News of Men and Women of the Industry

The Minister of Power has announced that **Mr. G. N. Green,** M.I.E.E., F.R.Econ.S., F.B.I.M., has been appointed deputy chairman of the North Eastern Electricity Board, following the appointment of **Mr. N. F. Marsh** as deputy chairman of the East Midlands Electricity Board. Mr. Green, who has been chief engineer of the Eastern Electricity Board since 1948, takes up his new appointment on 1st December next.

Mr. G. N. Green

He received his technical training at St. Helens Technical College and with the St. Helens Corporation Electricity Department. From 1926 to 1937 he was on the staff of British Insulated Cables, Ltd. (now British Insulated Callender's Cables, Ltd.), first as assistant engineer and later as technical assistant. He then joined the Croydon Electricity Department as distribution engineer, leaving in 1944 to become deputy city electrical engineer and manager at Peterborough, where he became city electrical engineer and manager in the following year, a position which he held until nationalisation.

Mr. H. V. Pugh, A.M.C.T., M.I.E.E., M.I.Mech.E., controller of the London Division of the Central Electricity Authority, has been appointed chairman of the Eastern Electricity Board in succession to Mr. C. T. Melling, C.B.E., who, as we have already reported, has been appointed a full-time member of the Electricity Council. Mr. Pugh received his general education in India, where he was born and where he served with the Indian Army. He was an apprentice with Burn & Co., Calcutta, and later carried on his training with the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, while also attending the Manchester College of Technology. In 1930 he was appointed chief electrical engineer to Cory Bros. & Co., South Wales, and five years later joined the South Wales Electric Power Co. as deputy superintendent at the Upper Boat power station, becoming superintendent of the station as well as Llynfi power station in 1937 and being appointed generation engineer of the South Wales Power Co. in 1943. He was appointed deputy chief engineer of the Manchester Electricity Department in 1944 and held this post until 1948 when he was appointed controller of the B.E.A. South Wales Division. He became controller of the London Division in 1951.



Mr. H. V. Pugh

At the sixth annual meeting of all members of the Local Advisory Conference in the East Midlands Area held on 29th October at the Corn Exchange, Leicester, Mr. J. Mould, chairman of the East Midlands Electricity Board, dealt with the report and accounts of the previous year and reviewed the progress made by the Board since vesting date. At the meeting **Mr. C. R. King,** former chairman of the Board and now deputy chairman of the Central Electricity Generating Board, was presented with a gold hunter dress watch which had been subscribed to by all the employees throughout the area. Also on view were the silver salver which had been presented previously to Mr. King by members of the Board and the silver card tray presented by the East Midlands Electricity Cricket League.

At the annual general meeting of the Incorporated Sales Managers' Association held on 7th November the following appointments were made:—President: the **Earl of Woolton,** C.H. Chairman: **Mr. A. Lucas,** M.C. Vice-chairmen: **Mr. W. R. Bowden, Mr. J. L. A. Hogg** and **Col. J. N. Lapraik,** D.S.O., O.B.E., M.C., T.D. (also hon. treasurer).

Mr. A. E. Bristow, who has been with C.A.V., Ltd., for over forty-two years, has retired. Mr. Bristow started with C. A. Vandervell & Co., Ltd., in the Installation and Service Department, and has for the past thirty-one years been personal assistant to Mr. E. L. Cadwallader, now consulting director of the company.

Sir Vincent de Ferranti and **Sir Claude Gibb** are to be made honorary Fellows of the Manchester College of Science and Technology on 30th November.

The Eastern Electricity Board has appointed **Mr. B. W. Ricks,** A.M.I.E.E., A.M.B.I.M., as engineer of the Northmet Sub-Area in succession to the late Mr. W. A. Brown. Mr. Ricks, who has been with the South Western Electricity Board at Bristol, received his technical training at the Plymouth and Devonport Technical College and served a student apprenticeship course with the B.T.H. Co. at Rugby before joining Plymouth Corporation. Shortly after nationalisation he was appointed deputy engineer in the Torquay and West Devon Sub-Area and later was planning engineer and senior assistant engineer for development and operations with the Bristol and North Somerset Sub-Area. He has been assistant chief engineer to the South Western Board since January, 1955.

Mr. B. W. Ricks

Mr. Ricks was vice-chairman of the Devon Section and chairman of the West of England Section of the Electrical Power Engineers' Association for a considerable time and has also been chairman of the South Western Managerial Section.

The annual dinner of "**The Lightmongers**" was held at Pimm's Restaurant, London, E.C., on 6th November when the president, Mr. H. W. Hall, took the chair; about

Chatting together at the open day on board the c.s. "Ocean Layer" are (left to right) Lord Chandos, Dr. J. N. Aldington (chairman, Submarine Cables, Ltd.), Capt. J. Marshall (commander, "Ocean Layer"), and Sir John Dean (joint managing director, Submarine Cables, Ltd.). A photograph of the "Ocean Layer" and a description of the open day are on page 901

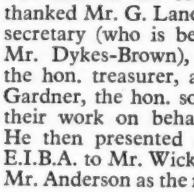
Mr. Henry Hall (left) with his successor, Mr. S. Anderson

ninety members and guests were present. The toast of "The Society" was proposed by Mr. H. F. Wickham, who thanked the Lightmongers for the help which they gave to the E.I.B.A. Mr. T. Jones proposed the health of the guests and Mr. K. S. Eslin, in responding, said that European free trade was bound to come and we would have to face up to a cheaper production rate. This meant simplification and long runs to keep tooling down. The society was a good medium for getting together to discuss such matters. The health of the president was proposed by Mr. S. Anderson, and Mr. Hall in the course of his reply thanked Mr. G. Lane, the retiring hon. secretary (who is being succeeded by Mr. Dykes-Brown), Mr. R. Stevens, the hon. treasurer, and Mr. V. G. E. Gardner, the hon. social secretary, for their work on behalf of the society. He then presented a cheque for the E.I.B.A. to Mr. Wickham and installed Mr. Anderson as the new president.

Lieut.-Col. J. D. S. Young, D.S.O., M.C., has been appointed general sales manager of Marco Refrigerators, Ltd. He joined the company as contracts manager in January, 1955.

We regret that in reporting in our last issue the appointment of **Mr. L. Jull,** production director of Lec Refrigeration, Ltd., as joint managing director with Mr. C. Purley, chairman of the company, Mr. Jull's name was incorrectly given as Mr. L. Bull.

Mr. W. H. Dunkley, B.Sc., M.I.E.E., M.I.Mech.E., chief generation engineer (construction), Yorkshire Division, Central Electricity Authority, has been appointed chief generation engineer (operation), Midlands Division, as from 1st January next. After a student apprenticeship with the English Electric Co., Ltd., Rugby, Mr. Dunkley joined the Dundee Electricity Department in 1926 and, two years later, went to Shanghai as assistant charge engineer of the Riverside power station, afterwards serving in the Chief Engineer's Department. He returned to England in 1934 to join the Central Electricity Board as operation superintendent for S.W. England and S. Wales. In 1937 he became personal engineering assistant to the chief engineer and general manager of the Hull Corporation Electricity Department and subsequently became deputy general manager. With the reorganisation of the electricity supply industry in 1948, he took up his present duties with the Yorkshire Division.

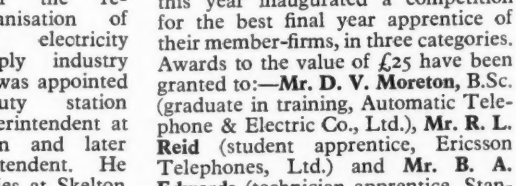


Mr. W. H. Dunkley

Mr. R. C. Hodson, A.I.E.E., M.Inst.F., station superintendent of Skelton Grange power station of the Yorkshire Division, Central Electricity Authority, has been appointed generation engineer (operation) of that Division. Mr. Hodson was educated at Leeds Technical College and Leeds University, and was a student apprentice with the Leeds Corporation Electricity Department. Subsequently, he held various positions in the Department and at Kirkstall power station. Soon after the reorganisation of the electricity supply industry he was appointed deputy station superintendent at Kirkstall power station and later became station superintendent. He took up his present duties at Skelton Grange in 1954.

Mr. R. C. Hodson

The annual dinner of the Midlands Branch of the **Electrical Trades' Commercial Travellers' Association** was held at the Pavilion Suite, County Ground, Edgbaston, Birmingham, recently and was well attended by representatives from all sections of the electrical industry in the area. Mr. D. E. Reynolds, B.Sc. (vice-chairman, Birmingham Branch, E.C.A.), proposed a toast to the E.T.C.T.A. (Midlands Branch) and the branch chairman, Mr. S. Le Marechal, responded. The vice-chairman, Mr. T. C. Browne, proposed the toast to the guests, to which Mr. F. Vincent Everard, M.I.Mech.E., J.P. (vice-president, Engineering and Allied Employers' National Federation), replied. The charity appeal was made by Mr. P. M. King and resulted in a record collection.



At the annual dinner of the Midlands Branch of the E.T.C.T.A. Left to right: Mr. S. Le Marechal (branch chairman), Mr. F. V. Everard (vice-president, Engineering and Allied Employers' National Federation), and Mr. D. E. Reynolds (vice-chairman, Birmingham Branch, E.C.A.)

Mr. R. S. Wren, who has been associated with the electric lamp and lighting industry for the past thirty-two years, has joined the Ekco-Ensign organisation. After early association with Philips Lamps, Ltd., Mr. Wren joined Pope's Electric Lamp Co., Ltd., in 1933, was appointed sales manager and secretary in 1949, and became director and manager in 1954.

Mr. R. S. Wren

Brown Bros., Ltd., have appointed **Mr. H. F. Acton,** previously assistant manager, Glasgow, as manager, Carlisle.

The Telecommunication Engineering and Manufacturing Association has this year inaugurated a competition for the best final year apprentice of their member-firms, in three categories. Awards to the value of £25 have been granted to:—**Mr. D. V. Moreton,** B.Sc. (graduate in training, Automatic Telephone & Electric Co., Ltd.), **Mr. R. L. Reid** (student apprentice, Ericsson Telephones, Ltd.) and **Mr. B. A. Edwards** (technician apprentice, Standard Telephones & Cables, Ltd.). These prizes were presented to the winners at the T.E.M.A. annual dinner on 13th November by the chairman, Sir Thomas Eades.

The Duke of Edinburgh, president of the Royal Society of Arts, visited the Society's headquarters in London on 7th November to present his gift of a new lecture bench. He also presented medals and diplomas awarded for special achievements. These included the Benjamin Franklin

Professor F. C. Williams with the Benjamin Franklin Medal presented to him by the Duke of Edinburgh

Medal, the first award of which has been made to **Professor F. C. Williams,** O.B.E., D.Sc., M.I.E.E., F.R.S., professor of electrical engineering, Manchester University, for his contributions to electrical engineering.

Mr. L. A. S. Robbins, A.M.I.E.E., has been appointed a director of Duncan Low, Ltd. He will be responsible for and supervise the sales in England and Wales, and will be resident in London, at 21, Folkington Corner, Woodside Park, N.12.

Mr. L. A. S. Robbins

Mr. G. T. T. Wigley has joined Higgs Motors, Ltd., Witton, Birmingham, as secretary and commercial manager. Mr. Wigley has spent the last four years on organisation and methods in the canning and shoe industries, but before this he was engaged in engineering, notably with Rolls Royce, Ltd., and Joseph Lucas, Ltd.

Mr. W. L. Wray, managing director of Wandleside Cable Works, Ltd., left yesterday (Thursday) for the United States on the *Queen Elizabeth.* He will be discussing on behalf of Wandleside Cable Works, Ltd., and Irish Cables, Ltd., problems connected with technical developments, particularly irradiation, as well as export problems and other matters. He is expected to be back in London early next month.

The annual dinner of the **Norfolk Electrical Circle** was held in Norwich on 6th November. Mr. E. H. Nichols, chairman, presided and was supported by the president, Mr. J. A. Sumner. Sir John Dalton, chairman of W. T. Henley's Telegraph Works Co., Ltd., proposed the toast to the electrical industry to which response was made by Mr. H. D. B. Wood, deputy chairman of the Eastern Electricity Board. The toast of the City of Norwich was proposed by the president, and Alderman A. E. Nicholls, Sheriff of Norwich, replied. The vice-chairman, Mr. T. L. Wilkes, proposed the toast to the guests on whose behalf Mr. R. A. Jackson, chairman of the Ipswich and District Electrical Association, responded.

Mr. Charles Purley, chairman of Lec Refrigeration, Ltd., left London Airport on Saturday for New York on his way to the 10th Exposition of the Air Conditioning and Refrigeration Industry in Chicago. He was accompanied by **Mr. R. H. Wall,** head of the Lec work study department, and they will be calling on various distributors in the United States and Canada during a three-week visit.

At last Tuesday's luncheon of the **Electrical Industries Club** the speaker was Mr. Victor Dale, until recently director and secretary of the British Electrical Development Association. Mr. Dale recounted some of his earlier experiences in the industry in an interesting and amusing way and he paid a tribute to some of the pioneers in electrical development with whom he had worked. He was accorded a hearty vote of thanks on the proposition of Mr. L. J. Luffingham. The president, Mr. A. F. Plummer, reminded members that the next luncheon would be held on 10th December.

OBITUARY

Mr. William C. Yuille, managing director of William C. Yuille & Co., Ltd., electrical wholesalers, died on 31st October at the age of seventy-one. Before joining the company, which was founded by his father, Mr. Yuille served part of his apprenticeship with G. & J. Weir, Ltd. Mr. Yuille had been prominent in the activities of the Electrical Wholesalers' Federation, serving on the Council for many years and being president in 1938. He was also a strong supporter of the Electrical Industries Benevolent Association, for which he introduced the E.W.F. annual collection during his year as president of the Federation.

Mr. H. H. Cressall, who introduced the manufacture of asbestos woven resistance nets to this country, died at his home on 1st November at the age of seventy-one. He started his career in 1902 and in 1914 founded the Cressall Manufacturing Co. His name became identified throughout the electrical industry with the well-known range of Cressall electrical products which, in addition to grids and nets, eventually included all types of industrial resistors. In December, 1955, the company was acquired by the Expanded Metal Co., Ltd., Mr. Cressall remaining as managing director. He leaves a widow and one daughter.

The late Mr. H. H. Cressall

Mr. H. E. Angold, A.M.I.E.E., who in 1927 designed and introduced the manufacture of electricity meters to Smith Meters, Ltd., died on 2nd November at the age of seventy-eight. Mr. Angold received his training with the G.E.C. in London and the B.T.H. Co., Rugby, and before joining Smith Meters, Ltd., he held appointments with the Oliver Arc Lamp Co. and the Metropolitan-Vickers Electrical Co. He retired in March last year but was retained by Smith Meters as consulting engineer.

Col. John C. Chaytor, A.M.I.E.E., was killed in a car accident on 8th November. Col. Chaytor was a director of Loheat, Ltd., Electroblock, Ltd., and other companies, and was formerly a director of the North Somerset Electric Supply Co.

Overhead Line Dispute

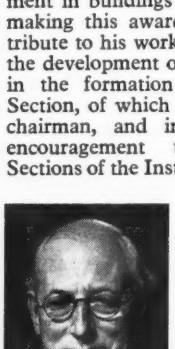
Earlier this year a dispute between the Central Electricity Authority and Mr. D. J. Glanfield, a Surrey farmer, was the subject of High Court proceedings which were eventually withdrawn, the two parties inviting the Minister of Power to give further impartial consideration to the siting of the line over Russells Farm (*Electrical Review,* 9th August, page 258). On Monday last the C.E.A. announced that it had received a letter from Lord Mills confirming the Authority's right to complete the line on the route originally authorised. At the Minister's request, the Authority has given an undertaking to Mr. Glanfield's solicitors that if, within a period of five years, Mr. Glanfield has constructed a new farmhouse and buildings beneath the line and should ask the Authority to remove the line it will be prepared to do so subject, *inter alia,* to agreement by adjoining owners and to Mr. Glanfield contributing £2,000 towards the cost of the work.

Lord Mills said that he had considered a suggestion by Sir Lionel Heald, Q.C., M.P., on Mr. Glanfield's behalf, but did not think that the heavy expenditure involved in altering the route would be justified by the present circumstances of the case.

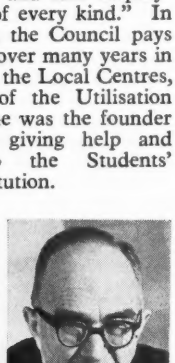
The dispute concerned part of the supergrid line between Melksham and West Weybridge. Except for the short section affected by the dispute, the line has been complete for nearly a year. Having regard to the importance of ensuring the maintenance of adequate supplies, particularly in South West England, during the winter peak period, the Central Electricity Authority states that it is its intention to take immediate steps to complete the work.

I.E.E. Awards

The Council of the Institution of Electrical Engineers has elected **Mr. H. T. Young,** a past-president of the Institution, to honorary membership, "in recognition of fifty years of devoted service in promoting the wider use of electricity in the service of man, and particularly its full and safe employment in buildings of every kind." In making this award, the Council pays tribute to his work over many years in the development of the Local Centres, in the formation of the Utilisation Section, of which he was the founder chairman, and in giving help and encouragement to the Students' Sections of the Institution.



Mr. H. T. Young



Sir Gordon Radley

The Council has also made the thirty-sixth award of the Faraday Medal to **Sir Gordon Radley,** K.C.B., C.B.E., Ph.D.(Eng.), the immediate past-president of the Institution, for his outstanding contributions in the field of international communications and particularly in the development of long-distance, deep-sea telephone cables and their repeaters.

Mr. Young was born near Buckingham in 1888 and received his early practical training with Rawlings Brothers and his technical education at the South Western Polytechnic. During the last fifty years he has been associated from the time of its foundation with Troughton & Young, Ltd., of which he is chairman and managing director; he is also chairman of its associated companies.

Mr. Young served on the Council of the Institution from 1927 to 1930, became a full member in 1931, was vice-president from 1932 to 1935 and president in 1936. In 1941 he became the first chairman of the Installations Section (later to become the Utilisation Section). Apart from serving on several other committees of the Institution and representing it on the British Electrical Development Association for five years, he took a special interest in student activities and in 1934, being particularly anxious to promote and maintain friendly relations between student members of the three major engineering Institutions, he presented a trophy, known as the Young Trophy, for which they compete annually in various sporting events. Mr. Young was also chairman of the London Committee of the Electrical Contractors' Association in 1923-24 and, for three years, he served on the Council of the Illuminating Engineering Society, receiving its first award of the Leon Gaster Premium.

Sir Gordon Radley, Director General of the Post Office, joined the Post Office in 1920 and was engaged on a variety of problems associated with materials, specialising in spectrographic techniques including X-ray diffraction. When the British electricity grid was under construction he worked on the problem of interference between power and communication circuits, and for a thesis on this work he was awarded the degree of Doctor of Philosophy by London University in 1934. After a period spent on studying corrosion problems, he was appointed an assistant staff engineer and became responsible for the development of the voice frequency signalling system later installed for long distance dialling over trunk telephone circuits. He was promoted to staff engineer, Research Branch, in 1939 and in 1944 he became the first holder of the office of Controller of Research; he also served as chairman of the Materials Committee of the Radio Research Board and of a committee formed to advise the Medical Research Council. He was a member of the Radar and Signals Advisory Board of the Scientific Advisory Council (Ministry of Supply) and chairman of its Line Communication and Electro-Acoustics Sub-Committee.

In 1949 he was appointed Deputy Engineer-in-Chief and in 1951 Engineer-in-Chief of the Post Office. On his appointment in 1954 as Deputy Director General, he retained, at his own request, technical responsibility for the British contribution to the work on the transatlantic cable. He took up his present appointment in 1955. He and Dr. Mervin J. Kelly, president of the Bell Telephone Laboratories, New York, were jointly awarded the international Christopher Columbus prize in 1955 for their work on the transatlantic telephone project.

Sir Gordon was elected a member of the Council of the I.E.E. in 1948 and, in 1951, was elected a vice-president. He has served on numerous committees of the Council, including the Research, Education and Training and Papers Committees, and has published numerous papers, several of which have been awarded Institution premiums, including the Sebastian de Ferranti (1939), the Fahie (1942) and the John Hopkinson (1955). He was chairman of the Measurements and Control Section in 1944.

I.E.E. Centre Dinner

On Monday last the Mersey and North Wales Centre of the Institution of Electrical Engineers held its annual dinner at the Grosvenor Hotel, Chester, under the chairmanship of Mr. T. Makin. Proposing the toast of the Institution, Lt.-Gen. Sir Otway Herbert, G.O.C.-in-C. Western Command, said that to-day every single part of the Army was concerned with electrical matters. Referring to the importance of R.E.M.E., he said that half of the new officers entering this branch of the Army would be electrical. In the recently announced cuts to be made in the Services no electrical officers or N.C.O.s would disappear. If we in this country were to succeed we should have to be very much more alive to science and realise how vital it was.

The response was made by Mr. T. E. Goldup (President, I.E.E.), who referred to a speech he made four years ago when deputising for the President at the same Centre's annual dinner. Then he had said that unless we faced up to the vast changes around us, our place in the line of nations would be poor and insignificant. This was equally applicable to-day. Our responsibility was to see that our younger men had the necessary training facilities otherwise a reduction in our standard of living would follow.

Professor J. M. Meek (past-chairman of the Centre) proposed a toast to the guests and Dr. J. E. Taylor (chairman, Joseph Crosfield & Sons, Ltd.) briefly replied.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £192 5s 0d
Fire Refined 99·70%	ton £191 0s 0d
Fire Refined 99·50%	ton £190 0s 0d
COPPER Tubes ..	lb 1s 10½d
Sheet	ton £218 0s 0d
H.C. wire and strip ..	ton £240 5s 0d
LEAD, English ..	ton £86 15s 6d
Foreign	ton £85 0s 0d
MERCURY	flask £72 10s 0d
TIN, block (English) ..	ton £730 5s 0d
ZINC, G.O.B. Foreign	ton £68 15s 6d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 6½d
Sheet	ton —
Wire	lb 2s 4d
PHOSPHOR BRONZE Wire	lb 3s 7½d
PLATINUM	oz £31 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 22½d—22½d

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Flat Rate for Electricity

THE following is an extract from a recent article on tariffs:

> ". . . or (c) by a combination of the latter tariff with the untilted tariff, effected by limiting the high kWh-charge of the tilted tariff to the number of kWh per kW of m.d. corresponding to the annual load factor of the intersection, Y, of Curves B and D, and applying to each excess kWh the low kWh-charge of the untilted tariff."

Perhaps it is unfair to give this out of its context and this letter is not a comment on one specific article, but are we not going to fantastic lengths to tailor-make tariffs to ensure that any type of consumer pays his dues according to the accepted economics of electricity supply without being unduly hurt in the process? By economics of electricity supply I mean the normal pattern of tariffs which aims at charging an individual consumer according to his load factor. If this pattern is implemented in full it will, of course, hurt many consumers.

Why should we aim to charge an individual consumer as if the undertaking were supplying him alone, even though we may introduce a clause such as a ceiling price to prevent the situation arising whereby he may decide it to be opportune to have his own generator anyway? In short, with system load factors of the order of 70 per cent (and with the cross-Channel link in the offing) has the time not arrived when a flat rate per unit (on a sliding scale) could be charged?

I am well aware that this will sound like heresy to many supply engineers, but surely the basic reason for the existence of a public electricity supply is the fact that it is more economic to supply a group than an individual and part of the reason for its being more economic is the diversity between consumers having less than 100 per cent load factor. In fact I would go so far as to say that under present general tariffs the 100 per cent load factor consumer is the least economic to the undertaking. He must hit the system peak whereas for other consumers the odds against this will (within limits) tend to lengthen with reduction in load factor. Acknowledgment of this fact is made by the introduction of a coincidence factor referred to in the article mentioned above. All of which supports my conviction that it is not equitable to favour or penalise a consumer according to his load factor *unless this is related to the system peak.* Tariffs are in use, of course, which take account of the system peak and there is still need for these.

Another bee in our bonnets is the continued insistence on treating lighting as the nigger in the woodpile. I think that with the modern acceptance of the desirability of good lighting the lighting load of most commercial and industrial premises must have a better inherent load factor than much of the heating and motive power load. Thus the flat rate tariff proposed should not be a variant of the usual variable block tariff which gives undue emphasis to the lighting load, but should begin at a more realistic figure—say, 2½d per unit. This would reduce in steps of, say, ¼d at intervals of probably several thousand units for industrial and commercial consumers.

For domestic consumers let us forget rooms, floor area, rateable value, etc. A first block for all of, say, 144 units at 2½d and equal blocks of 2d and 1½d units. I would also charge the domestic consumer the full cost or a large part thereof for installing a service, with a substantial percentage reduction for installing "load consuming" appliances.

There will be two main objections to a flat rate, namely (*a*) that the present tariff structure has in fact brought about an overall high system load factor and (*b*) a flat rate would be hard on (medium) low consumption users. (A few negligible users would gain on the figures quoted for domestic consumers but this class is dying out.) I can only give my opinion in relation to (*a*) and that is that the great majority of commercial and industrial consumers each have an inherent load factor which cannot be materially altered except at a greater cost than any resulting saving in the cost of electricity. The attempt to do so has created much bad feeling in the past. So far as (*b*) is concerned it is normal commercial practice to adjust prices only in respect of quantity purchasing.

I am convinced that the pattern of electricity supply has now reached or will shortly have reached the stage when a flat rate can be safely introduced.

Liverpool, 19. G. H. CURRIE.

Discouraging the Off-peak Load

MR. K. S. SUTHERLAND, in his critical survey of the changing conditions resulting from the generating of electricity from nuclear process heat ("Nuclear Process Heat," *Electrical Review*, 1st November), makes the point that, whereas the capital charges on changing from coal-fired boilers will increase from 20 to 60 per cent, the fuel costs will decrease from 73 to 33 per cent of the total costs of generation.

The conclusions to be drawn are that people who use electricity in the peak hours should pay more and those who take their load off-peak should pay less.

Churches with their associated activities are good examples of off-peak users whose meetings are confined to evenings and week-ends. One would expect them to be encouraged to become all-electric instead of being irritated by petty restrictions which could drive them to consider heating by gas. To quote an example:—The fixed charge on a two-part tariff for a church hall in Loughton was recently increased from £10 to £80, mainly on account of the installation of stage lighting for occasional use. With the limitation of funds available the church was compelled to choose between a cold hall under an off-peak tariff available only after 7 p.m. or remain on an all-in business tariff and remove the stage lighting.

Is this the attitude of other Electricity Boards?

Loughton, Essex. A. R. LASH, M.I.E.E.

National Power Farming Conference

The 7th National Power Farming Conference will be held at Cheltenham from 11th to 13th February next. Its theme will be "The Problem of Costs." The programme will include a reception at the Town Hall by the Mayor of Cheltenham, and a dinner-dance. Further details are obtainable from the conference organiser, *Practical Power Farming*, Dorset House, Stamford Street, London, S.E.1.

The Present Status of Steam

IN his recent presidential address to the Institution of Engineers and Shipbuilders in Scotland, Professor J. Small said that the practice of steam generation had now advanced to pressures beyond the range within which there was accurate knowledge of its thermodynamic properties. The theoretical analyses of the economic performance of high-pressure systems were therefore unreliable. Experience suggested, however, that provided conditions were matched to the power output of the plant the case for raising the pressure and temperature of the boiler steam could not be disputed. Practically the only way in which to effect a substantial increase in the fuel economy of electrical generation, such as was now necessary, was to choose conditions which increased the thermodynamic efficiency of the power station as a whole.

In the history of steam power it had taken 150 years or so for the pressure in general practice to climb to 70 lb/sq in. By 1930, however, the limits in power stations had reached 600 lb/sq in and 850 deg F and these conditions had for the most part been associated with 30 MW sets. At the time of the last war conditions for 60 MW units stood at about 900 lb/sq in and 900 deg F, but designs were then moving to new levels of the order of 1,500 lb/sq in and 1,050 deg F for 100 MW units and 1,500 lb/sq in and 1,000 deg F for units of 120 MW. In this country these levels were now being passed and elsewhere, too, pressures were being pushed up to and beyond 3,000 lb/sq in, the thermodynamic critical point in the water-steam system beyond which there was no intervention of a constant temperature interval to mark the end of the liquid and the beginning of the dry vapour phase.

In the United States a superheater outlet pressure of 4,500 lb/sq in with two stages of reheating to give a final temperature of 1,100 deg F was being used in a 675,000 lb/hr boiler in the Philo station, while the conditions for a 325 MW set, which had been constructed for the Philadelphia Electric Co., were 5,000 lb/sq in and 1,150 deg F at the turbine inlet with two stages of reheating at 1,000 lb/sq in and 250 lb/sq in respectively, to temperatures of 1,050 deg F and 850 deg F. In Germany the Leverkusen I plant of Farbenfabriken Bayer operated at a temperature of 1,130 deg F and a pressure of 2,300 lb/sq in and a boiler at a chemical plant at Hüls was designed for 4,800 lb/sq in and 1,130 deg F. Both these units supplied pass-out turbines and the economies of the use of steam at advanced conditions from such plant for industrial purposes merited special study.

Limits of Feasibility

These schemes were the products of the minds of practical people and must be taken seriously although they carried conditions to what were at present the limits of feasibility. They made heavy demands on constructional materials and raised serious problems for the designer. Reheating, which was essential for the full exploitation of these advanced conditions, took its toll in heat and pressure losses. It also involved the application of high temperatures at points where the specific volume of the steam was relatively high. The resultant relatively large blading was especially subject to thermal and other stresses and to the limitations set up by creep. Development had also outstripped our knowledge of the chemistry of feed water and the effects of its treatment on the generation of steam at such high pressures.

Research Problems

There was no field of scientific endeavour in which international co-operation was so close and cordial as in research on steam. In the United States work was being carried out on the formulation of thermodynamic properties as well as on thermal conductivity and viscosity. These subjects were also being investigated in Russia and Germany, while in this country the range of values of thermodynamic properties were being determined at the Imperial College up to a pressure of 1,000 atmospheres and 750 deg C and measurements of viscosity, while thermal conductivity up to 10,000 lb/sq in and 750 deg C were being made at Glasgow. This great interest in viscosity and thermal conductivity arose from the need to know more about the mechanics of heat transfer and the flow resistance of the water-steam substance with a view to refining the principles of boiler and turbine design.

Trade with China

UPON his return from a tour of Burma, Hongkong and China last week, Mr. F. J. Erroll, Parliamentary Secretary to the Board of Trade, who was accompanied by Mr. R. B. Tippetts, of the Board's Far Eastern Branch, held a Press conference to impart his impressions. After saying that in Burma he found much goodwill towards Great Britain and growing industrial activity, and mentioning conditions in Hongkong, Mr. Erroll proceeded to his main theme—possibilities of increased British trade with China.

From his observations he gathered that the Chinese had a natural mechanical talent which was being developed very rapidly. Industrial expansion was proceeding apace, largely with Russian aid in planning, machinery, equipment and advice. Now most of the Russian advisers had departed and the Chinese were anxious to obtain technical information in the widest sense on design and production. Technical information could be placed in two classes: the first was that generally available in published documents and technical journals; the other was the hard-won experience of individual firms who should, however, be very careful in parting with it.

There was a central organisation which allocated work and supervised the disposal of output. There were also import organisations, including an electrical one to whom he had explained what Great Britain could do in the way of increasing trade with China.

Mr. Erroll said that he had discussed with the Assistant Minister of the Electric Power Industry China's ambitious programme of electrical development. Much of the necessary equipment would come from Russia and Eastern Europe but there was still scope for other countries. He had told the Chinese that we were in a position to export complete factories or the components for them to assemble themselves. The Chinese were very " price conscious," and they were also conscious of the trade embargo. He had, however, impressed upon them that Great Britain had taken the lead in securing a revision of the embargo. He considered the Chinese to be good payers; the common method of payment was by 60- or 90-day letters of credit; they did not seem to be interested in long-term credits.

Mr. Erroll doubted whether unsponsored visits to China by individuals had much value. He advised intending visitors to have discussions first with the Chinese authorities in London. He regarded the acceptance of his visit by the Chinese Government as an indication of their interest in trade with Great Britain.

D.C. Winder Drives

I.E.E. Utilisation Section Paper

THE use of grid-controlled mercury-arc rectifiers for d.c. winder drives was the subject of a paper presented on 14th November by Messrs. L. Abram, J. P. McBreen and J. Sherlock (Metropolitan-Vickers Electrical Co.) before the Institution of Electrical Engineers' Utilisation Section. The example taken was the first installation of this kind in Great Britain (in 1955) at Monk Bretton Colliery. Considerably greater efficiencies, the authors showed, had been achieved than would have been obtained with either a.c. or Ward-Leonard drives as indicated in Tables 1 and 2.

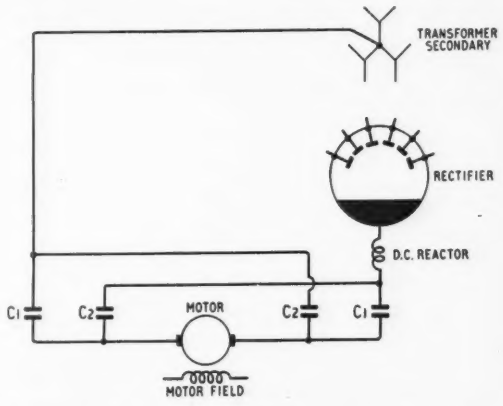
The r.m.s. rating of the motor was 300 h.p. (600 h.p. peak) and the speed 450 r.p.m. Its speed was controlled on closed-loop principles; the engine driver selected the direction of winding and speed, while the differentiation between rectification and inversion was made automatically. Only one rectifier was employed and reversal of the back e.m.f. of the motor was obtained by reversing the 500 V armature connections as indicated in Fig. 1. Rectification or inversion was differentiated by contactors C1 or C2, the capacity of which was limited by available ratings to 1 kA, so that field reversal was under consideration for larger units; the latter system would also give a smooth and controlled increase in torque throughout.

Automatic Change to Inversion

Change from rectification to inversion was brought about by a device which detected when the winder speed was greater than that required and operated the contactors. The interposing of grids between the anodes and the cathodes delayed commutation from anode to anode beyond the point of natural occurrence until later in the cycle, thus reducing the average d.c. output and so making possible an infinitely variable voltage. For inversion the current must flow when the anode voltage became negative by delaying the firing of the anodes beyond the zero voltage for rectification. The six-phase diametric star transformer in the controlling phase shift circuit was rated at only 1·5 kVA.

Protection against over-voltages due to switching and regeneration was ensured by an ignitron loading unit, but this method was expensive; for new schemes the connection of a resistor across the motor might suffice.

Backfires (a.c. short circuits between anodes inside the rectifier vessel) produced fault currents in the transformer and vessel of 30 to 50 times normal and were usually guarded against by quick-acting circuit-breakers on the d.c. side. To limit the value of arc-starvation surges, caused by exceeding the maximum current rating for any given temperature, non-linear resistance or spark-gap arrestors were connected between the anode and neutral. The minimum ambient temperature should be 15 to 20 deg C. Tests on the equipment had shown that



Connections of rectifier/invertor for Monk Bretton winder

accuracy of control in ascent or descent of the cage was about ½ per cent of full speed and satisfactory control of creep speeds was obtainable down to 3 in/sec. The motor armature voltage waveform had a ripple of 6·8 per cent of the mean voltage, but this had no harmful effects; commutation was sparkless at all loads, heating of the motor was normal and oscillograms indicated no discontinuity in the armature current. Provided the winder formed only a small part of the colliery load the effect of rectifier operation on the associated equipment or on the supply system was negligible.

TABLE 1.—COMPARISON OF POWER CONSUMPTION ON A.C. AND RECTIFIER WINDERS

Case	Motor rating	Shaft depth	Winding speed	Output per hour	Winds per hour	Power consumption			
						A.c.		Rectifier	
	h.p.	ft	ft/sec	tons		kWh/wind	%	kWh/wind	%
1	400	381	25·4	180	106	1·95	227	0·86	100
2	450	574	23·0	200	80	2·82	118	2·38	100
3	600	936	15·7	250	41·7	8·15	117	6·97	100
4	1,000	1,095	15·6	300	60	8·33	128	6·51	100
5	1,200	976	46·2	240	87·4	6·48	182	3·56	100

TABLE 2.—COMPARISON OF POWER CONSUMPTION ON WARD-LEONARD AND RECTIFIER WINDERS

Case	Motor rating	Shaft depth	Winding speed	Output per hour	Winds per hour	Power consumption			
						Ward-Leonard		Rectifier	
	h.p.	ft	ft/sec	tons		kWh/wind	%	kWh/wind	%
1	1,800	2,800	40·5	210	35·3	21·6	113	19·1	100
2	2,500	2,500	50·0	270	50·0	19·1	109	17·6	100
3	2,500	4,000	50·0	125	35·4	22·3	110	20·3	100
4	2,300	3,070	50·0	250	20·8	47·0	103	45·7	100
5	4,450	6,316	52·5	288	24·0	99·0	118	84·0	100

Digital Computers

THE discussion of the three papers on digital computers by the I.E.E. Measurement and Control Section on 5th November, which were reported in our last issue, was opened by Mr. W. S. Elliott (I.B.M. World Trade Laboratories), who considered the design method described by Messrs. Wilkes, Renwick and Wheeler to be straightforward to manufacture and readily understandable by a maintenance engineer; it was a major step forward in the organisation of computers. The paper by Messrs. Maclean and Aspinall had served a very important function in drawing attention to the residue number system and giving an example of the equipment used. It would be interesting to hear more about the advantages of using this system in a complete computer. Messrs. Kilburn, Hoffman and Hayes had referred to graphical output of high accuracy, one of the main calls for which was to give a visual indication for assessment. He wondered if an accuracy greater than that provided by a cathode-ray tube and analogue digital convertor could be made use of by visual assessment.

Dr. D. J. Truslove (I.B.M. World Trade Laboratories) suggested that the device for applying electroluminescence to digital computers described by Dr. Kilburn and his colleagues was perhaps not so good as might appear on the surface. Under what conditions was the high accuracy claimed for it required with an analogue output device?

Dr. D. M. Taub (I.B.M. British Laboratories) said that the great feature of the system described by Messrs. Wilkes, Renwick and Wheeler was its generality. Unfortunately, this was achieved at the cost of a more complex system than was strictly necessary to achieve its purpose.

Mr. K. L. Smith criticised the system of Messrs. Wilkes, Renwick and Wheeler as involving a complex wiring problem. He suggested an alternative method based on the magnetic shift register described by Wang. This enabled decoding functions to be eliminated from the micro-programme, inasmuch as the cores were spread out and arranged in strictly numerical sequence, each corresponding to particular outputs from the cores in the matrix.

Mr. J. H. Briggs suggested that electroluminescence might have a possible application other than curve plotting. There was often a need for a pictorial display generated from digital data, and this matrix would appear to be a useful device in this field.

Mr. D. W. Willis held that it would give some indication as to whether the general system was a better solution than the particular, if Messrs. Wilkes, Renwick and Wheeler could say how many of their steps involved an additional jump and in how many the following wire was stimulated, i.e. if the address were modified by one.

Mr. T. B. Tomlinson said that Messrs. Kilburn, Hoffman and Hayes improved their brightness discrimination by reducing the applied voltage and so getting lower brightness. Another scheme would be to put a thicker semi-conducting layer of, say, cadmium sulphide activated with chlorine on top of the electroluminescent layer to act as a non-linear resistance element. As to the use of evaporative layers, he remarked that early experiments seemed to show they were not fluorescent unless given a subsequent heat treatment to improve crystal structure.

B.E.A.M.A. Publicity Conference

ON Thursday and Friday last week the second Publicity Conference organised by the British Electrical and Allied Manufacturers' Association was held at the Connaught Rooms, London, W.C., under the general chairmanship of Mr. D. G. Denoon (B.I.C.C.).

At the first Thursday session, when the subject was "Press Advertising, Home and Overseas," Mr. C. H. Chaplain (B.T.H.) presided and the speaker was Mr. A. C. V. Clarkson (G.E.C.). Mr. G. Waller (Henry Wiggin & Co.) spoke on "Editorial Publicity" at the second session and Mr. C. H. Alsop (W. H. Allen, Sons & Co.) was in the chair.

Mr. Denoon presided at a luncheon when a number of guests were present. Col. B. H. Leeson (director, B.E.A.M.A.), who said he was at once a host and a guest, made an amusing speech in proposing the health of the guests and Mr. N. H. Codling (*Electrical Journal*) replied.

Mr. H. H. Lusty (Metropolitan-Vickers) dealt with "Compilation of Technical and Sales Publications" at the third session when Mr. Lewis Hart (Brush Electrical Engineering Co.) presided. "Printing Techniques" was the subject of the fourth session; Mr. S. Black (B.E.A.M.A.) was chairman and the speaker was Major C. W. Cousland (*Advertising Review*). An informal dinner was held at the Dorchester Hotel in the evening.

On Friday, at the fifth session, Mr. J. Read (Standard Telephones) read a paper on "Exhibitions and Their Practical Problems"; Mr. P. J. J. Roberts (Berry's Electric) was in the chair. The final item was a "Hobby-Horse" session at which three-minute speeches were made on their pet subjects by a number of delegates; Mr. W. L. Allison (Lancashire Dynamo & Crypto) was the chairman.

Euthanasia of Dogs

AMONG the latest British Standards to become available is B.S. 2909 : 1957, "Cabinets for the Electrical Euthanasia of Dogs," which has been prepared under the authority of the Electrical Industry Standards Committee as a result of a request from the British Veterinary Association. In the destruction of dogs by electrical means certain precautions must be taken to ensure that the procedure is humane. This necessitates the use of high voltages and makes a cabinet method essential to safeguard the operator. By passing a sufficient current through the head from side to side the dog is made unconscious and additional current is passed through the body to stop the heart. These currents may be simultaneous, or the head current may pass before the body current. In this specification the last mentioned method has been standardised as it gives the operator opportunity to observe that the dog has been stunned before the killing voltage is applied. The question of an automatic method for the delivery of the two shocks in sequence is under consideration and may form the subject of a further specification. Copies of B.S. 2909 : 1957 are available from the British Standards Institution, 2, Park Street, London, W.1, price 5s.

Teachers for Technical Colleges

THEIR SUPPLY AND TRAINING

AT an ordinary meeting of the Institution of Electrical Engineers on 7th November, there was a discussion on the report, "The Supply and Training of Teachers for Technical Colleges."* This was a report of a committee and was presented by Dr. Willis Jackson, F.R.S. The committee was appointed by the Minister of Education in 1956 to consider a White Paper (which had been published early in that year) the main objectives of which were to increase the annual output of students from advanced full-time and sandwich courses from the 1955-56 figure of 9,500 to 15,000, and to increase those attending part-time day courses from 355,000 to 700,000. This programme of expansion was associated with a building plan, the cost of which, inclusive of laboratory equipment, was expected to be about £100 million. Expressed in terms of teaching hours this represented an increase of roughly 50 per cent over that of the 1955-56 session. The report was outlined in the *Electrical Review* of 24th May last, but we think it is as well at this stage to outline the principal points in the report again.

Statistical Position

In that session the colleges had about 11,000 full-time teachers, not including 391 principals and vice-principals, and some 40,000 part-time teachers. Although this represented an encouraging growth in both classes a mere continuance would fall far short of the requirements of the situation in 1960-61. It was, in fact, estimated that by that date 7,000 additional full-time and 8,000 additional part-time teachers would be required—an increase of 64 per cent and 20 per cent respectively. The difference was due to there being more full-time and sandwich course work, and to an extension of part-time day study, both of which could be handled most effectively by full-time staff. This meant that the number of full-time teachers in service would have to increase over the five years in question at the rate of 1,400 per year, compared with the recent annual rate of 770. Allowing for various forms of wastage this would mean an annual recruitment of full-time teachers of 2,300, compared with 1,300 in recent years.

The increased number of graduates in technology required for teaching could only come from industry and appropriate Government Departments, since practical training and experience were essential. Industry must therefore be willing to accept, and indeed to encourage, the transfer to full-time teaching of experienced members it could ill-afford to lose, as the only means of ensuring a much augmented future supply of junior recruits of high quality.

No recommendations were made in the report on salary scales, although it was pointed out that it was now possible for full-time teachers to be paid at rates which compared more favourably than is generally supposed with those available in industry. Transfer from industrial employment to teaching was, however, often hampered by pension considerations. Other conditions of service in technical colleges, including the avoidance of excessive teaching loads and the more generous provision of assistance as well as improved opportunities for research, for periodical return to industry for further experience and for carrying out consulting work, also required effective action by the education authorities.

Part-Time Teachers

The extent of the need for part-time teachers would be affected by the ability to recruit full-time staff and would in any event be larger. The necessity for employers to arrange for members of their staff to teach during the day on a greatly increased scale was therefore emphasised, otherwise colleges might be unable to make the educational provisions required. As a particular aspect of this help it was recommended that carefully selected senior staff members should be brought into close association with the academic activities of the Colleges of Advanced Technology and the Regional Colleges to help not only with the advanced teaching work, but with the formulation of policy.

Discussing the desirability of a large-scale expansion of teacher training it was recommended that the present pre-service course should be supplemented by another for those already in service. An associated proposal was the establishment of a residential Staff College in which senior staff members of colleges and representatives of industry, commerce, Government Departments and the universities and schools could discuss the aims, needs and methods of technical education in the light of experience and development in these related fields. Finally, it was recommended that a permanent advisory committee should be set up so that the many matters falling within the terms of reference of the committee could be pursued and the whole subject of technical teachers kept under continuous review.

DISCUSSION

The Minister of Education, Mr. Geoffrey Lloyd, in opening the discussion, said that in his view for several generations past the country had scandalously neglected technological and scientific education. While the quality had been very high, there had been insufficient quantity, and a drastic change in the nation's approach to the problem was necessary. When trying to discuss a technical or scientific problem with people who had no scientific training at all, it was very difficult to make oneself understood, and those people had the greatest difficulty in understanding what was being said. In this age when progress depended so much on science and technology that was a weakness. Therefore, the spread of scientific education in the schools was a very good thing. More technologically and scientifically educated people were needed at the heads of boards of directors of the great industrial firms.

The Minister stressed the importance of co-operation from industry, pointing out that to obtain the highest quality of teacher a certain degree of transfer was necessary between technical colleges and industry. Technical colleges had to be up to date and to know the latest methods of teaching students. There should be no

* H M. Stationery Office, 4s.

financial sacrifice by the teachers, but rather, perhaps, a financial advantage.

Mr. E. C. Godfrey (president, Association of Teachers in Technical Institutions) said that from experience of present staffs the main comment on the Report must be on the question of excessive teaching hours. There should be a general recommendation that no teacher should be called upon to teach for unreasonable hours when others were released to do research, to obtain extra training or to return temporarily to industry.

Mr. L. J. Davies (director of research and education, British Thomson-Houston Co.) supported the idea of co-operation between industry and technical colleges, and gave some details of the scheme operating at Rugby. Mr. F. B. P. Browning (assistant education officer, Warwickshire County Council) suggested that all concerned should be informed as soon as possible which colleges would be mainly concerned with advanced work. Once the pattern was fairly clear, the other technical colleges might find it easier to devote their energies to the training of craftsmen and to the forms of training for technicians.

Mr. Maynard M. Boring (member of President Eisenhower's Committee on Engineering Manpower) said that one great problem encountered in the United Sfates was the lack of appreciation by the public of the work of the engineer and the scientist. Young people were driven away from scientific and technical fields because of completely erroneous ideas that scientists devised things to kill people. In a study of the reasons for people leaving the General Electric Co., the greatest single reason was to go into teaching. That company had 296 engineering teachers on retainerships during the summer period, including 186 engineering professors, who received one-ninth of their annual salary plus transportation to and from the school for themselves and families. They also received $125 a month in addition. Experiments were being conducted on teaching mathematics, science and English by closed-circuit television. In Pittsburg one teacher was teaching physics over a college closed-circuit television, which was considered to be very useful in augmenting the present system.

Mr. C. W. Humphreys (director, G.E.C. Research Laboratories) referred to the importance of seeing that the thought of moving from industry to teaching arose in the mind of the man who was going to move, and suggested that any semblance of coercion would defeat the object. Mr. C. Jameson (principal, Garnett College) said that as greater numbers would be attending technical colleges in the future, the classes would be composed of a greater variety of ability and aptitude than ever known before. Teachers must therefore realise that from now on sympathy for and understanding of students would be far more important than in the past.

Mr. A. H. Albu, M.P., wondered whether enough had been made of the advantages of being a teacher. The graduate down from university who went into industry was fortunate if he had three weeks' holiday a year, when the works were closed and his opportunities for cultural activities were severely limited. More publicity might be given to the more varied life which could be enjoyed by a teacher. Sir Hugh Linstead, M.P., suggested that there was no one solution to the problem, which involved many factors, for example, the greater use of women in teaching, which had not been mentioned, and an attempt to make science and technology more popular in some of the older schools which still had an arts tradition. The Report at long last provided a yardstick, and in four or five years' time it would be possible to see what progress had been made.

Mr. A. A. Part (Under Secretary, Ministry of Education) said there was room for research into the "learning process," which was particularly true of technical education, especially at the levels concerned with the teaching of technicians and craftsmen, for which the methods adopted at present were not necessarily always the best suited. The Minister had accepted the recommendation in the Report that a Standing Advisory Committee should be established to deal with technical teachers, and it was hoped that Dr. Willis Jackson would accept the chairmanship.

B.B.C. Annual Report

THE annual report of the British Broadcasting Corporation for the year ended 31st March last records that the Engineering Division operates and maintains for the various services 200 transmitters with powers ranging from 100 W to 400 kW, 164 sound broadcasting studios, 20 television studios and eight television mobile control rooms. Interference from foreign stations with reception of the B.B.C. medium-wave broadcasts worsened somewhat during the year and it is therefore satisfactory to note that the v.h.f. sound service had been made available to some 84 per cent of the population. By the end of 1957 it is hoped to have twelve v.h.f. stations in operation (plus one temporary station) covering 95 per cent of the population. The trend towards the greater use of magnetic tape recording has continued and during the year this medium was used for 75 per cent of all recordings made.

Well over 90 per cent of the population was brought within range of the B.B.C. television service by the end of 1956, a major step in attaining this figure being the bringing into service of the new London station at Crystal Palace, which should have an effective radiated power of 200 kW by the end of the year. By this time the coverage of the B.B.C. television service will exceed 98 per cent of the population. Interference with television reception from abroad was at times more pronounced than in the past few years, mainly as a result of the steady increase in solar activity. Interference has also been caused by "forward scatter" transmissions and the possible development of this type of communication service is causing the B.B.C. some concern.

Wrought Aluminium

TWO new British Standards for wrought aluminium and aluminium alloys for electrical purposes form a series with B.S. 2627, "Wrought Aluminium for Electrical Purposes. Wire." The demand for these has arisen because of the increasing use of aluminium for electrical conductors of many types. The first of the new standards, B.S. 2897, deals with drawn strip used for electrical conductors such as windings for rotating electrical machines or transformers. Its requirements are suitable for controlling the quality of electrical-purity aluminium strip supplied for general electrical components made to other British Standards.

The second standard, B.S. 2898, deals with bars and sections used for electrical conductors such as busbars, and components of switchgear. Its requirements are suitable for controlling the quality of electrical-purity aluminium and aluminium alloy supplied for components made to other British Standards, e.g. B.S. 159, "Busbars and Busbar Connections in Air, Oil or Compound."

Because of the rapid developments in the application of aluminium for electrical purposes, arrangements have been made for both these standards to be reviewed in about two years' time. Users of B.S. 2897 and B.S. 2898 are invited to submit to the British Standards Institution any comments and suggestions on which to base the intended revisions.

Copies of these standards may be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 4s (B.S. 2897) and 5s (B.S. 2898).

PARLIAMENTARY REPORT

Windscale Accident

In the House of Commons last week Mr. Harold Macmillan, the Prime Minister, gave the House an assurance, when he presented the report of the inquiry into the accident at Windscale No. 1 pile, that the accident had no bearing on the safety of the nuclear power stations being built for the electricity authorities. He said there was no evidence that the accident had done any significant harm to any person, animal or property. The Government had set up three committees, each under the chairmanship of Sir Alexander Fleck, to evaluate the data derived from the accident and to recommend what measures were needed to remedy the deficiencies in organisation to which the A.E.A. had called his attention. The accident occurred during a routine maintenance operation, called the "Wigner release," which had to be carried out at intervals. No experiment was taking place for either civil or military purposes.

Mr. Alfred Robens asked whether, in view of the tremendous importance of the export value of atomic power stations to this country, the White Paper giving the report of the inquiry underlined in greater detail that there could be no possibility of an accident of this character in the atomic power stations that we were building.

Mr. Macmillan said he had prepared a technical appreciation which set out in an annexe to the report the reasons why this type of military installation had no connection whatsoever with the civil nuclear power stations where an accident could not occur because of the entirely different character of the two processes.

European Free Trade

The Prime Minister said that in the negotiations on the European free trade area the Government would keep in close consultation with industry. Neither the United Kingdom nor any other participating country could afford to enter the free trade area at any price; equally, none could afford to let the negotiations fail, for the price of failure might be very heavy indeed. It might mean not only the economic and political division of Europe, but would be a grievous blow to the strength and unity of the Western Alliance. The Commonwealth trade and economic conference next spring would certainly be opportune, for there were big developments on the way.

He also envisaged greater co-operation between the United States and her allies on the more economic use of the free world's resources of applied science and technology. The common agreement in Washington, he said, was that the free nations could no longer afford to waste resources in skill and money. Whatever came of the present discussions, he felt that in perhaps the comparatively near future the nations of the free world would have to make an even more and significant contribution than hitherto to the common cause.

Wages Arbitration

The Government, said Mr. Macmillan, had no intention of interfering with the normal processes of wage arbitration but they meant to make it clear that finance could not automatically be made available to meet any arrangement which might be reached by merely creating additional outgoings. In the case of transport and other nationalised industries, deficits were met from the Exchequer, thus there were responsibilities for any Government. They did not mean that there could not be changes in conditions or improvements in wages. Such increases could come either out of savings or greater efficiency.

Stabilising Production Costs

Sir David Eccles, President of the Board of Trade, said the world was waiting to see whether this winter Britain could hold her costs of production. The Government would not disappoint them, because it was clearly in the nation's interest to check rising prices and to build up reserves. Our volume of international trade was keeping up well. Production was running at about 3 per cent above last year and showed no signs of contracting. Imports were running at a level which indicated that businessmen generally must be confident that expansion would continue.

Canada was a promising market and he welcomed the Canadian trade mission, due here on 22nd November.

Shift Working

Mr. Gresham Cooke appealed for more widespread shift working in industry. A survey in 1954 revealed that only 12 per cent of workers were engaged on any form of shift-working. In the steel industry it was done; he saw no reason why the engineering and manufacturing industries should not do the same. One of the advantages of two- and three-shift working was that the load on the power stations was more evenly spread and therefore lower at any one time. This was no time for a shorter, 40-hour week.

Nationalised Industries Purchasing

Mr. Philip Goodhart, referring to the report of Sir Harold Howitt into the allegations of waste in the activities of the British Transport Commission, said that in the nationalised industries there was a clash between those on the purchasing side, who were naturally interested in buying at the lowest possible price, and the engineers who were chiefly interested in delivery dates and fancy specifications. The engineer was usually higher in rank, therefore the men on the purchasing or contracting side—if they wanted to keep their jobs—were likely to knuckle down to the engineers. It was essential to give some help to the contracting men. This could be done by setting up an independent commission rather like the Comptroller-General's watchdogs who, from time to time, would study the contract procedure of the nationalised industries, and purchasing practice.

Tariff System Revision

The use of tariffs was changing. They were now used not to protect full employment but primarily as a weapon to expand the markets for goods overseas. The Bill to revise the tariff system would be a very large measure and would tidy up no fewer than eight previous Acts and 70 amendments to Finance Acts. It was designed to put into the Government's hands a modern instrument for the making of a tariff, and to rewrite a tariff in a way which would enable the Government to carry out such great projects as the Free Trade Area.

Canadian Manufacturers and Trade with Britain

Free Trade between the United Kingdom and Canada at the present time was called "impossible" by Col. R. D. Harkness, outgoing president of the Canadian Electrical Manufacturers' Association, when addressing a Press conference during the Association's recent annual meeting. He said that the suggestion raised a host of problems and brought to serious attention a comparison of the Canadian and British economies. Where changes in the pattern of trade could bring about expanding employment they should be prepared to give them full and favourable consideration, but where such changes could result in serious distortion of the manufacturing segment of their economy, then they must resist them.

Mr. Thomas J. Bell, the newly elected president of the Association, told the annual meeting that production by Canada's electrical manufacturing industry during 1956 was valued at $1,215·8 million, 11 per cent more than in the previous year. He predicted that 1957 would be a peak production year. Mr. W. Frank Wansbrough, chairman of the major appliance division of C.E.M.A., said a recent sales survey showed that Canadians bought more major electrical appliances per household than the peoples of any other country in the world.

INDUSTRIAL NEWS

Proposed Electrical "Approvals Board"

After lengthy preliminary discussions of an informal kind, a conference on the subject of an approvals board for domestic electrical appliances, held recently at British Standards House, was attended by high-level representatives of all sections of the supply, manufacturing and distributing industries and of consumers.

There was unanimous agreement that a scheme should now be prepared for closer consideration, with a view to providing the electrical industry with an "approvals service" for its products. It is expected that the scheme would include a certification mark — accompanied by suitable explanatory wording—as the appropriate means of indicating that electrical goods bearing it complied with the nationally recognised standards and with good British practice. Approvals schemes already operate in many overseas countries and, especially with the possible development of the European Free Trade Area, this country should have similar arrangements so as to ensure that its high standards are maintained.

While a small working committee is engaged on drafting the details of the proposed scheme (which will make full use of the industry's existing testing facilities), the trade and other organisations represented at the conference will seek a precise mandate for the nomination of members.

N.I.C.'s First Annual Report

The first annual report of the National Inspection Council for Electrical Installation Contracting covers the period from 10th August, 1956 (the date on which the company was incorporated), to 31st March, 1957. It records the election of Mr. C. R. King as chairman in succession to the late Mr. P. V. Hunter, and the appointment of the chief technical officer, Mr. E. J. Sutton, and the 14 inspecting engineers. The latter took up their appointments in the first three months of the year and are now on an average carrying out nearly 100 inspections per week. The first edition of the Roll of Approved Electrical Installation Contractors, which was published in June, contained the names of about 3,500 undertakings.

A fuller, because more recent, account of the Council's activities is contained in the second progress report, covering the period 16th May to 30th September, 1957. This shows that the Council is working well within its budget of £53,000 for the year ending 31st March, 1958, and that a further 68 names have been added to the Roll. Applications for enrolment continue to be received at the rate of between 5 and 15 per week. A number of firms, where a decision had been postponed pending a further inspection, have now been inspected for the second time, and the large majority have shown a substantial improvement in their standard of work and, in consequence, have been accepted for enrolment. Of the 2,300 approved contractors who have undergone a routine inspection since the beginning of the year, 5 per cent were found to have a very satisfactory standard of work and to fully observe the Council's rules, and 2 per cent were below the required standard, indicating inadequate supervision and, in some cases, lack of suitable testing equipment. The standard of work of the remaining contractors tested was considered good or reasonably satisfactory, but with minor departures from good wiring practice.

At the luncheon held after the annual general meeting last week, Mr. Forbes Jackson recalled that the story of the N.I.C. went back 75 years to when Lord Kelvin and Colonel Crompton realised the necessity, with the spread of electricity, of providing skilled advice on its use. The result had been the first edition of the wiring regulations which to-day were produced by a committee of the I.E.E. representative of the whole industry, and which formed the basis of the Council's work. He emphasised that the N.I.C. was not a trade organisation but had been set up for the benefit of the consumer. The difference in cost between a good and bad installation was very small and even where a good installation was more expensive the consumer should be glad to have an installation he knew was safe.

Railway Electrification Progress

Work commenced last week on the erection of overhead conductor wire for the electrification of the British Railways (London Midland Region) between Wilmslow and Mauldeth Road. A special wiring train is working in two sections, the first fitting insulators, cantilever arms and tie rods to the steel masts and the second attaching the overhead conductor wires to the cantilever arms. This will be followed later by inspection carried out by wagons fitted with mock overhead current collecting gear of the pantograph type on the roofs. This section of the line will be used as a proving ground for the new system. Conductor wire made by British Insulated Callender's Cables, Ltd., is being used.

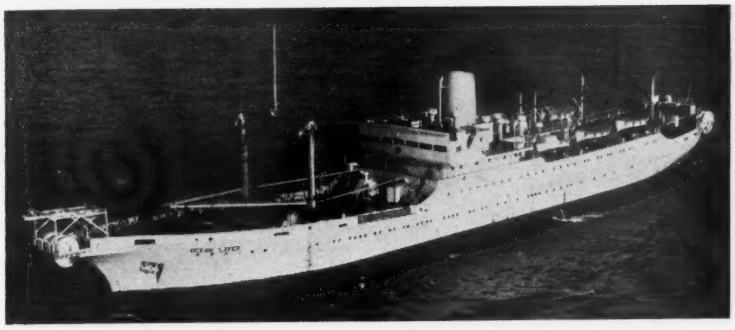
The special wiring train being used for the erection of overhead conductor wire on the London Midland Region, British Railways

E.D.A. Public Speaking Competition

Four subjects have been chosen by the Electrical Development Association for next year's Public Speaking Competition. They are "Progress and Rural Amenities," "How Advertising Helps the Consumer," "Nuclear Energy" and "Leisure Hours." Members of the staffs of the electricity supply industry who have not attained their 35th birthday on 31st May, 1958, are eligible to compete. As usual area competitions will be held (with cash prizes), the winners going forward to the national final, held in London, where the Faraday Silver Challenge Shields are presented to the winners. Entries close on 2nd December next. A booklet, "Public Speaking is Great Fun," aimed at interesting potential participants in the competition, is available, free of charge, from E.D.A., 2, Savoy Hill, London, W.C.2. This book gives details of the rules, the subjects, some brief hints to competitors, and also competition entry forms.

Work of the "Ocean Layer"

The 4,600 tons cableship *Ocean Layer*, which has recently been helping to lay the new telephone cable from California to Hawaii (*Electrical Review*, 2nd August, 1957), is now being loaded at Greenwich with some 1,000 nautical miles of cable for the renewal of telegraph cables belonging to Cable & Wireless, Ltd., in the Atlantic and Indian oceans. The *Ocean Layer*, which is owned jointly by Siemens and Telcon, is the second



A recent photograph of the cableship "Ocean Layer" in the English Channel

largest cable ship in the world. She was first commissioned as a cable laying vessel in 1955 and, except for brief periods loading cable, has been continuously on charter.

During the past two years the *Ocean Layer* has sailed no less than 60,000 miles and has laid 3,500 nautical miles of cable. Apart from the Pacific telephone cable, this has included the laying of a telephone cable between Norway and Denmark, renewal of telegraph cables in the Atlantic and the laying of the power cable to Vancouver Island. In 1959 it is anticipated that she will lay part of the second transatlantic cable between France and America.

A cableship is a working ship and on one of the two "Open Days" last week we had an opportunity of seeing how her cable handling gear and equipment are so arranged that the fullest use is made of the available space. There was also an exhibition of various types of submerged repeaters and a film was shown of the processes in the manufacture of the first transatlantic cable, the greater part of which was produced in the Erith works of Submarine Cables, Ltd.

One of the exhibits revealed in strip cartoon form the rather surprising information obtained by installing a "flight recorder" in a repeater laid in deep water. This showed that the repeater made 2,000 revolutions going down and 2,000 revolutions when being brought up before the record ran out. It has recently been decided that the company should embark on the major production of the internal electronic units for submarine repeaters and the air-conditioned factory being constructed at Erith is planned for an output of one repeater a week.

Census of Production

As already announced, the Census of Production to be taken in 1958 for the year 1957 will be a simplified census on a sample basis, similar to the census for 1956. An Order (Census of Production (1958) (Returns and Exempted Persons) Order, 1957 (S.I. 1957 No. 1901)), prescribing the matters about which returns may be required, has now been made by the Board of Trade. Undertakings producing coal, gas, electricity, oil-shale, crude or refined petroleum or shale oil products are exempted from making Census of Production returns to the extent to which they supply the necessary information to the Minister of Power (or in certain cases to the Secretary of State for Scotland). Copies may be obtained from H.M. Stationery Office (price 3d).

Wages Agreement Proposals

Addressing the annual conference of the Institute of Directors in London last week, Lord Chandos, the president, said that the wage claims now being presented by the trade unions would have to be examined with patience, but at the present time it did not seem that there was a prima facie case for agreeing to them. He visualised a new structure under which there would be a longer notice of termination of employment based on length of service. There might also be a five-year agreement giving an annual increase of, say, 2½ per cent per annum to every employee of a year or two's standing. This increase would be calculated on the basic wage for a 44-hour week and there would be an undertaking that no wage claims would be made during the five-year period. Lord Chandos agreed that some regard would have to be paid to the circumstances of particular industries which might be affected by special conditions. He was sure that the British worker would respond to greater security of employment by improving his output.

Industrial Efficiency Exhibition

In the power for industry section of the Industrial Efficiency and Productivity Exhibition, now being held in the City Hall, Manchester, nearly the whole of the balcony is occupied by scale models of power plant. The site model of Calder Hall, lent by the United Kingdom Atomic Energy Authority and exhibited publicly in this country for the first time, shows the general layout of the complete station, consisting of four reactors, the last of which will come into operation next year. There is also a representation of the Dounreay establishment, showing the layout of the site, with the two reactors, at present nearing completion, and the associated chemical plants which will prepare and process the fuel elements.

The nuclear power exhibits of the John Thompson Group include a sectionalised model of the Berkeley nuclear power station which is being built for the C.E.A. Amongst the other exhibitors are the Central Electricity Authority (North West, Merseyside and North Wales Division), the Brush Group, Crossley Bros., Ltd., Lever Bros., Ltd., and Renold Chains, Ltd.

In the display by the North Western Electricity Board is an illustration of automatic control of illumination by a photo-electric cell.

Among the devices chosen to emphasise the wide use of electronics are a gamma ray switch; a pH recorder to control the level of acid or alkali in a solution; an ultra-violet crack detector; a stroboscope inspector for examining objects in motion; and a yarn evenness tester.

There are also many exhibits demonstrating the big potentialities of electricity for measuring and electronic instruments, space heating, mechanical and material handling equipment, and precision and small tools.

The exhibition, sponsored by the Institution of Works Management, was officially opened by Sir Charles G. Renold, J.P. The eighty exhibitors occupy approximately 50,000 sq ft of floor space. Talks have been given on works management and productivity.

Radio Transmitters for Khartoum

An order for high-frequency radio telecommunications equipment to a value of nearly £50,000 has been awarded to Marconi's Wireless Telegraph Co., Ltd., by the Sudan Posts and Telegraphs Department for the Khartoum Communications Centre. With the new Marconi transmitters, direct communication will be possible with the capital cities of Europe and many important centres in Africa and Asia. The order includes three 3½ kW h.f. transmitters, type HS31, with their associated drive, keying and monitoring equipments, and a 30 kW linear amplifier. Six receivers will be supplied, two for independent sideband operation, two for single sideband operation and two double-diversity telegraph receivers, one of which will be adapted for frequency shift diplex signals.

Nuclear Plant for Japan

Negotiations between the Japanese and British authorities for the supply to Japan of a large "Calder Hall" type reactor are still proceeding. The Tokyo correspondent of *The Times* says that instructions have been sent to the Japanese delegate in the negotiations in London to accept the latest version of the British draft agreement. It appears that the point in dispute,

relating to the right of inspection of the plutonium to ensure that it was not used for military purposes, has now been settled by the Japanese acceding to the British proposals. In any event it is said that the plutonium would have to be sent to this country for processing.

Mercury Lamps Improvements

All-round improvements in the manufacturing processes for all Osram mercury lamps have resulted in a 25 per cent increase in their declared average life from 4,000 to 5,000 hours. This has been achieved without reducing luminous efficiencies, and it applies both to the 250 W and 400 W MA series of lamps and the range of Osram quartz arc tube, MB and MBF lamps in wattages from 80 to 1,000.

The A.E.I. Lamp & Lighting Co., Ltd., has also announced that the life of all "Mazda" mercury vapour discharge lamps in general use (types MA, MAF, MB, and MBF) is now 5,000 hours. The average lumen output is maintained at the same level as before and prices are unchanged. An average life of 5,000 hours for the whole range of lamps represents in most cases a 25 per cent increase.

Institute of Fuel Joins the B.N.E.C.

At a recent meeting of the Board of the British Nuclear Energy Conference, under the chairmanship of Sir John Cockcroft, the Institute of Fuel was admitted to membership of the B.N.E.C. The purpose of the Conference is to co-ordinate the activities of the constituent members in the field of nuclear energy; meetings are held and a journal is published.

The constituent societies of the B.N.E.C. are now the Institutions of Civil, Mechanical, Electrical, and Chemical Engineers; the Institutes of Physics, Metals, and Fuel; and the Iron and Steel Institute. The offices are at 1-7, Great George Street, London, S.W.1.

Pumping Station Electrification

The Metropolitan-Vickers Electrical Co., Ltd., is to supply the London Hydraulic Power Co. with equipment valued at £70,000 for the electrification of the Rotherhithe steam-operated pumping station. This is one of the largest water pumping contracts received by Metropolitan-Vickers, which is also supplying similar equipment, worth £15,000, for the same company's City Road pumping station. The new order comprises fourteen a.c. and d.c. motors from 80 to 370 h.p., two Ward-Leonard sets, control gear, switchgear and transformers.

New Irish Cable Factory

The Northern Ireland Development Council announces that one of the new "advance" factories at present under construction on the Carnmoney Estate, near Belfast, is to be occupied by a new subsidiary company of Reliance-Clifton Cables & Industrial Products, Ltd., of Leyton, London. The new company will be known as Belfast Cables, Ltd., and will be initially equipped to manufacture plastic covered cables for Great Britain and overseas. The company plans later to extend its range of products. It is hoped to start production in March or April of next year. In the first phase of development employment will be given to about 100 workers.

Brush Conference in Beirut

With a view to promoting export trade the Brush Group is holding a four-day conference, opening on 26th November, in Beirut. Factory managing directors and Middle East representatives will go to Beirut by air and Brush agents from seventeen countries will attend. The party from England will be led by Mr. I. Morrow, managing director, and Mr. M. Clear, export director. The conference will close with a banquet which will be attended by the President of the Lebanon and the British Ambassador.

Lighting Trunking

We have been asked by Crompton Parkinson, Ltd., to say that the coupling piece for use between links of Crompton "New-line" lighting trunking reported in our 25th October issue was not at the time covered by a patent.

Window Display Competition

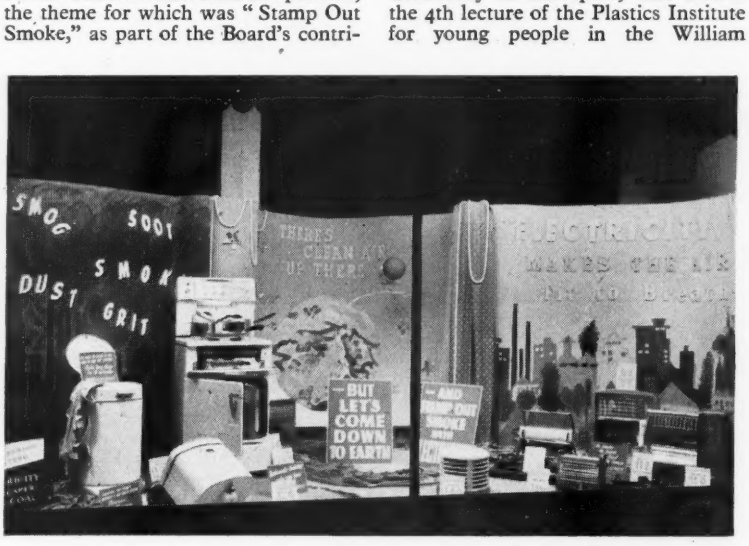
Chorley Service Centre, in the No. 4 Sub-Area of the North Western Electricity Board, has been nominated winner of the ninth annual window display competition. The winning window was designed by Mr. M. Hall, service centre supervisor. Nearly 100 service centres entered the competition, the theme for which was "Stamp Out Smoke," as part of the Board's contribution to the North West Clean Air Campaign at present being conducted by the National Smoke Abatement Society. As in the past, displays had to be produced on a small budget and were first judged on a Sub-Area basis before final area judging by a panel comprising Board members, senior officers and outside display specialists. The winning window employed a topical theme. A satellite was shown circling the earth with the caption "There's Clean Air Up There—But Let's Come Down to Earth and Stamp Out Smoke With Electricity." The window stressed that electricity makes the air fit to breathe and featured various types of domestic appliances. Second to Chorley came Longsight (Manchester), in the No. 1 Sub-Area, while Stockport (No. 7 Sub-Area) was third. Other Sub-Area winners were:—Wigan, Oldham, Darwen and Kendal.

"Wireless World" Diary

The 1958 *Wireless World* Diary is now available. In addition to the usual diary pages, it contains 80 pages of reference material, giving information on such radio matters as base connections for 700 current valves, design data, addresses of radio organisations in this country and abroad, licence regulations, and much other technical information. It is in two bindings, leather (price 6s 3d) and rexine (4s 6d), plus 4d postage. The diary is published by T. J. & J. Smith, Ltd., 12, Hanover Square, London, W.1, in conjunction with *Wireless World*, Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

Progress of Plastics

Professor C. E. H. Bawn, Professor of Inorganic and Physical Chemistry, University of Liverpool, will deliver the 4th lecture of the Plastics Institute for young people in the William



The winning display by Chorley Service Centre in the North Western Electricity Board's window display competition

Beveridge Memorial Hall, Senate House, London University, W.C.1, on 2nd January (2.30 p.m.). The subject will be "The Progress of Plastics." Tickets are obtainable from the secretary to the Council, the Plastics Institute, 6, Mandeville Place, London, W.1.

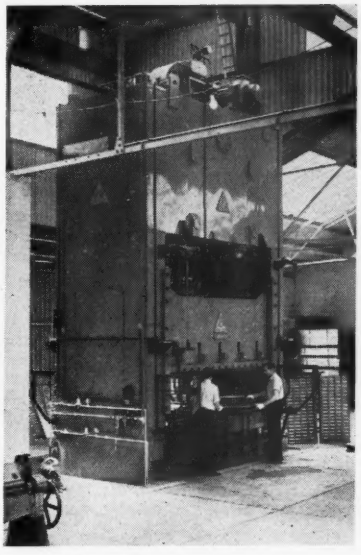
The Design Centre

In its annual report for 1956-57 the Council of Industrial Design states that the setting up of the Design Centre has led to a great increase in the scope and importance of the work of the Council. This was shown by the attendance (a total of 672,784, averaging 2,300 a day); the number of trade visitors from home and abroad making use of the Centre's services; the willingness of manufacturers to submit their products for selection and to pay for their exhibition; the interest of the retail trade in the items selected; and the number of exhibits shown.

News of the Design Centre was given to 40,000 overseas buyers by direct mailing of leaflets and brochures. A second design congress, on the theme "The Management of Design," was held addressed primarily to British industry but supported by delegates and speakers from many countries. Opened by the President of the Board of Trade, its aim was to extend an understanding of the role of the designer to a wider industrial audience and to relate design to industrial management, emphasising the importance of forming a design policy at board level. The selection procedure and collection of exhibits used by the Council has proved excellent for catering for overseas exhibitions. At the request of the Board of Trade, a display of over 400 exhibits was chosen for the 1956 Milan Samples Fair. A small display of 80 exhibits was also shown on the official Government stand at the Vienna Autumn Fair. To coincide with the State Visit to Sweden some 300 exhibits were chosen from the Design Centre by the Council's opposite number in Sweden for an outdoor display in Stockholm's Kungsträdgarden. During the year the Council's Scottish Committee moved into new premises in Glasgow, and since then considerable progress has been made.

New Dimplex Plant

A 600 ton press has now been installed in the second of two new factories built for Dimplex, Ltd., at Millbrook, Southampton. The press was made at the Vickers-Armstrong works at Newcastle-on-Tyne and forms part of a major development programme of the company. To house it the company had to build a large extension, including a roof-lifting operation. The factory in question is known as Dimplex No. 2 factory, and it is one of two new factories which the company has had built. No. 2 factory houses the tool room, press shop and welding departments, and



The 600 ton press installed in the new Southampton factory of Dimplex, Ltd.

No. 1 factory, which adjoins, houses the pre-treatment tanks, stove enamelling plant, electrical assembly shop, packing and dispatch departments and warehouse.

Higher Pay for South Shields Electricians

South Shields Town Council has decided to offer increased rates of wages to help in recruiting electricians for the Corporation Lighting Department. At present the Department has only one electrician, others having left to work elsewhere where better wages are obtainable. Including eight hours' overtime and a 20 per cent bonus, with a basic rate of 4s 8d an hour for a 44-hour week, the total amount received will be £16 2s weekly.

Main Line Electrification in North-East

British Railways have been in touch with Durham County Council regarding the proposed electrification of the east coast main railway line. Mr. A. Dean, chief civil engineer, North-Eastern Region, stated that reconstruction work would have to be undertaken at several bridges to provide more headroom. Electrification work would proceed progressively from York, and the scheme was expected to be completed in 1961. There are four bridges which the County Council intends widening while increased headroom is being provided.

Practical Electrician's Pocket Book

The scope of the 1958 edition of "The Practical Electrician's Pocket Book" (Odhams Press, Ltd., price 6s) has been extended by the inclusion of articles on ultrasonics, magnetic amplifiers and automatic assembly (which includes details of the printed circuit technique). A number of sections of the Pocket Book have been largely rewritten, and that on motors has more material on starters, while the chapters on maintenance and installation now include new ones on motor standards and machine tool equipment. Other new chapters deal with estimating and rectifiers. The work of the National Inspection Council for Electrical Installation Contracting is outlined in the "Recent Developments" section. Altogether there are 29 sections in the Pocket Book covering most aspects of an electrician's work.

Radio Trades Appointments Service

The Radio Trades Examination Board has been granted a licence by the London County Council for the operation of an appointments service. This service, which will be free to employers and employees, will be limited to holders of the Board's radio or television servicing certificate. Further information regarding the appointments service may be obtained from the secretary, the Radio Trades Examination Board, 9, Bedford Square, London, W.C.1.

"Neptune" Reactor Starts

On Thursday last week the zero energy nuclear reactor ("Neptune") at Harwell "went critical." The reactor is being used in connection with the design of a prototype submarine reactor. Enriched uranium is used as the fuel and the moderator is ordinary water.

Trade Announcements

The cable division of **Connollys (Blackley), Ltd.,** has appointed Mr. T. G. Handley as its representative for the North East of England, and Mr. B. B. Newton to cover East Anglia.

The **Hoffmann Manufacturing Co., Ltd.,** has opened a new stockroom at 127, Bath Road, Slough (telephone: Slough 22351).

The **Gatehill Manufacturing Co., Ltd.,** has appointed the North West Electrical Agency, 17, Douglas Road, Hazel Grove, nr. Stockport, directed by Mr. M. C. Toner, as its agents for the North-West of England.

The **Ransome & Marles Bearing Co., Ltd.,** has acquired the exclusive British rights for the manufacture and sale of Thomson ball bushings.

As from 18th November the Leeds office of **Allen West & Co., Ltd.,** will be at Brotherton Chambers, Grace Street, Leeds, 1 (telephone: Leeds 33481).

The offices, trade counter and stores of the Belfast branch of **Siemens Edison Swan, Ltd.,** are now at 41, Queen Street, Belfast (telephone: Belfast 20437).

NEW ELECTRICAL EQUIPMENT

Cable for Tropical Service

A new type of plastic insulated cable that can operate almost anywhere in the tropics as efficiently as it does under home temperature conditions is announced by PERMANOID, LTD., New Islington, Manchester, 4.

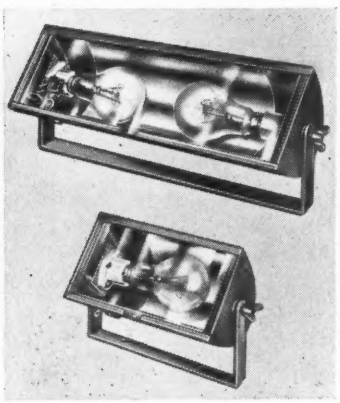
Most types of cables have hitherto been subjected to a sharp derating of their current-carrying capacities, often as much as 50 per cent, when used in high ambient temperatures. The new "Gulf" cable retains its full rating up to a temperature of 149 deg F. Tests show that a life of at least ten years can be expected for the new cable when operating under severe tropical conditions under which normal natural-rubber-insulated cables would generally give a life of down to one year.

The general design of the new cables relies on the use of a special grade of hard polyethylene as the core insulant, protected by an outer sheath of special p.v.c. compounded with polymeric plasticisers (known commercially as "Diolpates") which remains inert, unaffected by oil, salt-water, a wide range of chemicals and high temperatures. The cables are orthodox in their construction.

Production has so far been mainly devoted to surface wiring cables, but the new construction can be applied to power cables, armoured and unarmoured, signal or control cables, armoured or unarmoured, and to general wiring types as used in conduit.

Lighting Fittings

The well-known range of trough "Realites" has been completely redesigned and new models are now obtainable from the manufacturers, ROWLANDS ELECTRICAL ACCESSORIES, LTD., R.E.A.L. Works, Hockley Hill, Birmingham, 18. Both one- and two-lamp models, suitable for downward or upward lighting, are available.



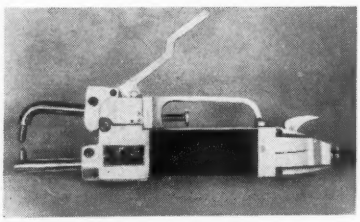
Rowlands one- and two-lamp trough "Realite" lighting fittings

All models incorporate a high-grade aluminium "electro-brightened" anodised reflector, those for upward lighting being fitted with a clear toughened glass front. They are supplied complete with porcelain lampholders and the two-lamp models are wired to a connecting block fitted close to the cable entry. They are suitable for use with 60/100 W g.l.s. lamps and have many applications such as illumination of special displays, small signs, notice boards, etc.

Portable Welders

The introduction of a new range of resistance welding machines is announced by PORTABLE WELDERS, LTD., Castle Mills, Buckingham, Bucks. They are producing two basic machines, a lightweight welder for garage, sheet metal fabrication and sub-assembly tack welding, and the other a heavy duty machine for continuous production on assembly work which is particularly applicable to the motor car industry, metal furniture and the manufacture of large agricultural machinery.

The lightweight portable machine, known as the "Leopard Autospot," weighs only 25 lb and operates



"Leopard Autospot" lightweight spot welder by Portable Welders, Ltd.

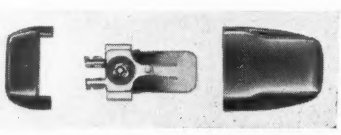
normally from a 220/230 V a.c. supply and with a current of 5,000 A at the electrode tips. Welding rate is 4·8 kVA and the machine normally requires a 220/230 V 50 c/s single-phase supply, although it is also available for 110 V and other voltages.

The "Leopard S.70C" heavy duty welder has been designed for the fabrication of sheet metal work where it is necessary to take the welder to the job. By the incorporation of a circular suspension sling hanging from a spring balance it is possible to turn the welder through an arc of 180 deg. It has an output of 8,500 A at the electrode tips and with a power factor close to unity, the mains current draw is well below 100 A and is controlled by a mains fuse of 30 A. The hand operated model has a toggle action, pressure mechanism giving a tip pressure of up to 600 lb with an 8in throat depth, and provides a welding rate of 8·5 kVA. For production work, this machine is used with water cooled arms and usually in conjunction with an electronic timer giving weld times of $\frac{1}{25}$ to $1\frac{1}{2}$ seconds.

For even heavier work the company has produced the "Leopard S.100" machine which is similar in design and operation to the S.70 but has a welding rate of 10 kVA and is capable, when fitted with pneumatic operation, of higher production speeds.

Electric Blanket Cut-out

An improved snap action safety cut-out and "Blanketstat" (type T Mk. XVII) has been produced by OTTER CONTROLS, LTD., Otters 'Ole, Market Street, Buxton. Although it retains the same snap action and high contact pressure of the previous model (type T Mk. III) it also has several new

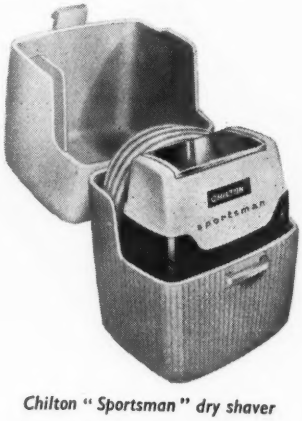


An exploded view of the Otter Controls type T Mk. XVII "Blanketstat"

improvements. The terminal connections are now covered and separated, the case is non-combustible and its new shape is hardly detectable in a blanket and gives closer temperature control. It has crimped terminals for safe and speedy connections and can be stitched in place.

Dry Shaver

A new streamlined electric shaver, the "Sportsman," is the latest addition to a range of dry shavers produced by CHILTON ELECTRIC PRODUCTS, LTD., Hungerford, Berks. It is easy and comfortable to operate and its two-tone plastic body, in deep chestnut brown and pale cream, is "contemporary" in appearance. It has an extra wide shim head, of nickel to avoid corrosion,



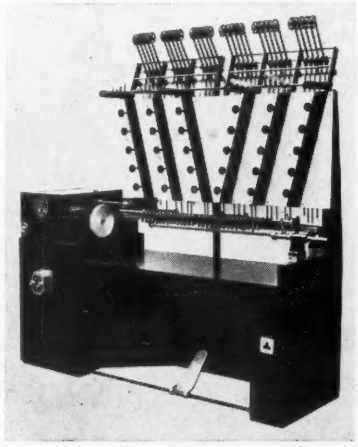
Chilton "Sportsman" dry shaver

measuring only 0·0015in in thickness. Its vibrator type movement has no bearings to wear out, or springs to break, and is almost entirely suspended by rubber. It is supplied in an attractive, unbreakable cream plastic travel case, and the price is £4 10s 2d plus 19s 10d purchase tax in the United Kingdom.

Coil Winding Machine

A bobbin winding machine capable of accommodating 30 reels of 4½in diameter and wire from 20 to 46 s.w.g. is the latest development of WESTOOL, LTD., St. Helen's Auckland, Co. Durham. The winder has a 3 b.h.p. three-phase motor with push-button stopping and starting. Winding is controlled by a predetermined electric revolution counter and a Warner electromagnetic brake which prevents the overrunning of the mandrel.

The machine has a maximum traverse of 6in and can be fitted with a special platform allowing hand interleaving of stick-wound coils for a paper length of up to 36in. It can also be provided with means of parting off the coils on completion of winding. The maximum speed,

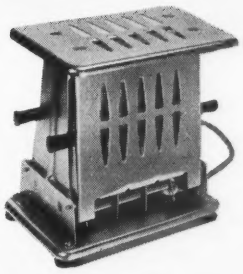


Westool 30 reel coil winding machine

dependent on the mandrel size, is 1,000 r.p.m. which can be varied at will through a foot pedal. A special electrical socket on the front of the winder enables a soldering iron to be plugged in for use either for repairing breaks or for fixing starting leads or tags.

Electric Toaster

A recent announcement from the KENWOOD MANUFACTURING CO., LTD., Woking, Surrey, states that their "Turnover" electric toaster, production of which was discontinued in 1952, has been re-introduced and an up-to-date version is now available. The toaster is of all-metal construction, heavily chromed, and is provided with insulated handles and feet. Three voltage ranges are available, 100/120,



Kenwood "Turnover" toaster

200/220 and 230/250 and the loading is 500 W. It toasts two slices of bread at one time and its drop-down door enables the toast to be turned. The price is £2 0s 7d plus 8s 11d purchase tax in the United Kingdom.

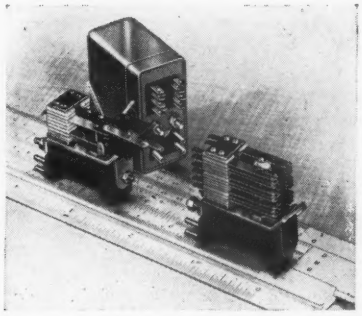
Sub-Miniature Relay

A Mark 2 version of the Hopwood-Por type P3 sub-miniature relay is now available from D. ROBINSON & CO., 58, Oaks Avenue, Worcester Park, Surrey. This relay can now have up to six change-over contacts for use in control circuits, or two special change-over contacts with very low capacities for such uses as "send-receive" and crystal switching. It can also be used in temperatures up to 100 deg C, has a new shock-proof knife-edged armature mounting and as it has all tags and fixings at one end it can be mounted through a chassis (a piercing tool is available) or on to a printed circuit.

The design target for the P3 was to provide as many of the features of the "3,000-type" as miniaturisation allows. The manufacturers state that the new relay has buffered blades with twin contacts; excellent sensitivity; and if required a residual adjusting screw by which the fall-off point can be set to between 20 and 60 per cent of the operate point. Coils can be single or double wound, slugged and up to 9,000 ohms in value. Consumption can be as low as 100 mW and typical contact ratings are 2 A at 25 V d.c. and 1 A at 250 V a.c.

The low capacity relay has low loss insulation and a capacity between open contacts of under 1 pF. The tag layout has been arranged to keep

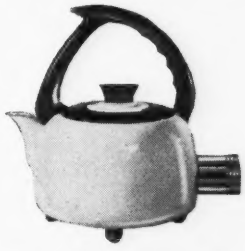
Hopwood-Por Mark 2 sub-miniature relay



capacities to earth low and constant. As a guide to price, the open relay with two standard change-over contacts and a coil up to 4,000 ohms is 21s 9d. The relays can be supplied with a dust cover or hermetically sealed.

Electric Kettle

An electric kettle is now included in the range of coloured enamelware cooking utensils manufactured by JURY HOLLOWARE, LTD., Brierley Hill, Staffs. This latest "Jetware" kettle is a 3½ pint model and is fitted with an automatic safety cut-out. In common with other appliances in the company's range it was designed by "Francis"

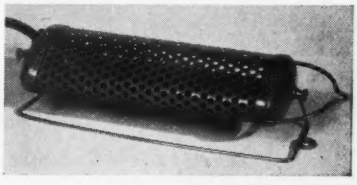


Jury "Jetware" electric kettle

and is available in a selection of gay contemporary colours. The price, inclusive of purchase tax, is £4 9s 6d.

Electric Heater

A useful low-wattage electric heater manufactured by Remploy, Ltd., is now available from FOSTER ELECTRICAL SUPPLIES, LTD., 75, Marylebone High



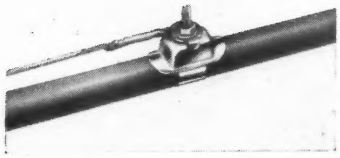
Remploy "Chillchaser" electric heater

Street, London, W.1, the sole distributors.

Apart from its use in the garage as a car heater it can also be used as a clothes or storage cupboard heater or serve as a de-mister for shop windows. The loading of its flat wound mica type element is 100 W and it is available in 200/220 and 230/250 voltage ranges. It measures 8¾in long by 2⅜in wide by 2¼in deep and is provided with 6ft of t.r.s. cable, stand and suspension handle. The price of the "Chillchaser" is 16s plus 7s purchase tax in the United Kingdom.

Earth Clamp

In response to a demand for a safer, simpler and more durable earth clamp, CABLE COVERS, LTD., St. Stephen's House, Westminster, London, S.W.1, have developed a "Universal"



Cable Covers "Universal" earth clamp

clamp. The completed assembly provides a clamp of streamlined design claimed to be efficient in appearance as well as in performance. It is supplied with 6in of cadmium plated copper strip and as it is suitable for all pipe diameters in the B.S. 951 range, the stocking of various sizes is eliminated.

Rotary Switch

A new 15 A 230 V rotary switch, claimed to be smaller in size and lower in cost than conventional switches, has been introduced by ARCOLECTRIC (SWITCHES), LTD., Central Avenue, West Molesey, Surrey.

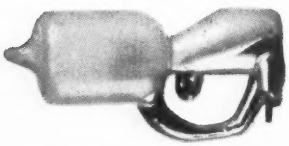
Its four-position rotary reciprocating action gives double-pole, series/parallel and off and it is suitable for cookers, washing machines and many other similar appliances. The switch, catalogue No. C.S.200, is priced at 8s 6d, without knob.

Arcolectric 15 A rotary switch

Plastic-sealed Mercury Switches

Mercury switches of all types completely protected and sealed by a special plastic coating process are now available from ENGEL & GIBBS, LTD., Warwick Road, Boreham Wood, Herts. The coating is approximately 0·04in thick, and not only protects the switches from damage, but if the glass case is shattered all the mercury will be contained in the protective coating.

This development will be of particular interest to manufacturers whose equipment can easily be damaged by contamination with mercury. The coating is translucent and the operation of the switch can, therefore, be readily viewed without interference. An alternative type of opaque coating is also available which is suitable for tropical environments.

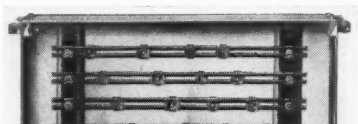


Engel & Gibbs mercury switch

Busbar Chambers

A new range of busbar chambers suitable for 600 V supplies is announced by BILL SWITCHGEAR, LTD., Aston Lane, Perry Barr, Birmingham, 20. These compact "Minibar" busbar connecting units have been designed principally to meet the demand for an efficient and economical system of linking up the incoming and outgoing feeders on small distribution installations. The twin busbar design enables the sliding cable clamps to be fitted in any position quickly without the necessity of disturbing or drilling the busbars.

The cases are constructed of specially rust-proofed sheet steel with cast corner pillars, detachable top and bottom plates of $\frac{1}{8}$in thickness and with bolt-on covers. Cases are supplied undrilled but clearance holes can be provided at an extra charge. Cable glands can also be fitted up to and including S.5. The twin solid h.c. copper busbars of $\frac{1}{4}$in by $\frac{1}{4}$in section are mounted on robust porcelain insulators.

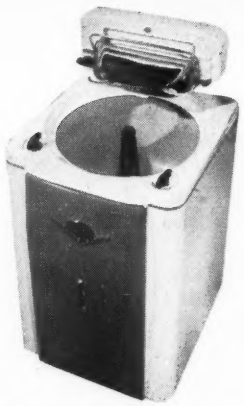


Bill Switchgear "Minibar" busbar chambers with sliding clamps

Three sizes of sliding cable clamps are available: 15/30 A for cables up to 7/·044in, 40/60 A for cables from 7/·052in to 19/·044in; and 100 A for cables from 19/·052in to 19/·064in. Special attention has been given to wiring space to allow for quick and easy connection of cables and the busbars are offset to give extra wiring room at the mains incoming side. The chambers are finished in a durable aluminium gloss enamel.

Washing Machines

The latest Servis "Superheat" and "De-Luxe" washing machines, manufactured by WILKINS & MITCHELL, LTD., Darlaston, South Staffs., have been completely restyled, inside and out. This new styling embodies a full length door which bears the new "Servis" emblem, a combination of gold lettering set in a chromium frame. The motif is also reproduced in monogram form on the wringer. Operation of the washer has been made simpler and both the pump switch and the master control for motor, washing action, etc., are now fitted to the top of the cabinet. The pump has been re-designed and is now claimed to be completely foolproof, while a new feature of the "Superheat" power wringer is a special finger-grip underneath the wringer to make even easier its closing by hand.



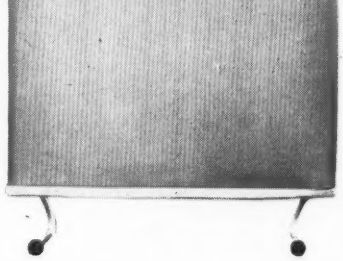
Wilkins & Mitchell "Superheat" washing machine

Both the "Superheat" (with 3 kW heater) and the "De-Luxe" models (unheated) are available in a full range of contemporary "Gaytone" colours, or alternatively in all-white or all-cream. The prices are £61 11s ("Superheat") and £54 6s 3d ("De-Luxe") plus £27 14s and £24 8s 9d, respectively, for purchase tax in the United Kingdom.

Convector Heater

A new electric portable space heater, of modern design, has been announced by NEW DAY ELECTRIC (SALES), LTD., 28, Queen Anne's Gate, Westminster, London, S.W.1. Styled the "Westbury," it is fitted with low temperature "black heat" embedded elements, loaded to 1 kW. The heater also has provision for half-heat switching.

The front panel is of fluted bronze, and it is supported on cream tubular legs with padded feet. The dimensions are 25in high by 26in wide by 3in deep and the price is £7 19s 6d plus £3 10s purchase tax in the United Kingdom.



"Westbury" convector heater (New Day Electric (Sales), Ltd.)

NEW BOOKS

Internal Audit in the Public Boards. By W. L. Abernethy, A.S.A.A., F.I.M.T.A. With contributed chapters on Electricity Supply and Gas Supply by E. N. Judge, A.I.M.T.A., A.C.W.A., and F. W. Johnson, B.Comm., A.A.C.C.A., A.C.I.S. Pp. 189+VII. Shaw & Sons, Ltd., 7-9, Fetter Lane, London, E.C.4. Price 27s 6d.

The national Electricity and Gas Boards, in common with many other public boards and authorities, are required to have their annual accounts audited by external auditors appointed by the appropriate Minister. Such an audit cannot be made until after the accounts have been completed for the year under review.

In addition to this statutory audit it is usual for the Board itself to conduct what is known as an internal audit on a continuous basis by its own staff. Ideally, this should be complementary to the external audit, and indeed the Government district auditor expects an adequate system of internal audit to be in operation in any authority with whom he has to deal. At the same time it must be entirely independent, and doubtless this involves some degree of overlapping since the internal auditor and the statutory auditor operate largely in the same field. Moreover, they have a common interest in ascertaining that there is an effective system of internal check to prevent or detect error and fraud, and an adequate accounting system to provide the information necessary for preparing true and fair financial statements. But in addition to these shared duties of factual verification, the internal audit, through its continuous operation, can become an important instrument of financial control and an aid to the prevention of waste and inefficiency. The internal auditor also often carries out duties of the kind now called " Organisation and Methods."

Approximately two-thirds of the work under review is identical with the same author's " Internal Audit in Local Authorities and Hospitals " and is based on his experience in the Comptroller's Department of the London County Council. This is followed by chapters on internal audit in the electricity and gas industries by officers of the South Eastern Electricity Board and the North Western Gas Board respectively. The whole forms an excellent account of this important subject and will repay careful study by the Board officials concerned. Some day, perhaps, the accounting principle will be applied to the Boards' technical performances, and the internal audit will become even more important than it is to-day.—D.J.B.

Electrical Engineering Circuits. By H. H. Skilling. Pp. 724; figs. John Wiley & Sons, New York. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 70s.

It is often a far cry from Ohm's Law to the Laplace transformation. Professor Skilling proceeds from one to the other in this book, and so combines the basic electrical relationships with modern concepts and methods of network analysis. Electric circuits in general are described, " heavy " and " light " current applications being equally stressed. A typical example is the subject matter of two adjacent chapters—" Electric Filters " and " Unbalanced Three-Phase Circuits."

The Laws of Ohm, Kirchhoff, and Faraday form the basis of electric circuit theory, and of the first chapter in the book. The formation of an equivalent circuit to represent a practical system is always the first step in analysis, and is stressed in the second chapter. A review of complex algebra provides an introduction to the methods of analysis used for simple circuits. Average power and effective current in a.c. systems are defined, and the phenomena of resonance described by mathematical and graphical methods. These basic conceptions of the electric circuit form the first third of the book.

Network analysis, in common with many other activities, is simplified by logical organisation. This process results in sets of simultaneous equations and routine methods for their solution. The central third of the book is devoted to such equations, network theorems, and their application to many circuits. These include coupled circuits and transformers, which naturally lead to non-linear elements and the Fourier series.

The concluding third of the book introduces the more powerful and general concepts of circuit analysis. The exponential Fourier series and the Fourier integral are used as an introduction to the complex frequency plane and the Laplace transformation. A general treatment of two-terminal pair networks precedes a chapter on electric filter networks. The problems of balanced and unbalanced three-phase circuits form the last two chapters.

Every chapter is terminated by a very useful summary and a set of problems covering the subject matter of that chapter. This book is an undergraduate text based upon teaching experience. The reviewer believes that every electrical engineer would find inspiration within its covers.—K.W.W.

Practical R.F. Heating for the Wood Industry. By J. Pound, M.I.R.E., A.I.E.E., F.I.M.Wood T. Pp. 198; figs. Heywood & Co., Ltd., Ingersoll House, 9, Kingsway, London, W.C.2. Price 30s.

The technicalities of radio frequency heating are in a sphere akin to radar and often remote from the experience of people who use it in their factories. Yet if full advantage is to be taken of its exceptional powers the gap must somehow be bridged and this is the task Mr. Pound has set himself within the confines of the woodworking industry. He has drawn on his considerable experience in this field and produced a handy volume, well laid out and full of practical information and advice. It must be of real use to woodworking factories, small or large.

There is, however, no harder task for an expert than to explain his subject in a completely non-technical way. He requires an acuity of insight into the untuned mind of his reader and a clarity of expression in his own, which might tax the powers of experienced novelists, let alone electrical engineers.

In this book, avowedly devoid of technicalities, the author might have done better to prune his subject matter more ruthlessly. Alternatively, he might have credited his readers with at least a basic knowledge of mathematics and physics. As it is, in his attempt at over-simplification he sometimes departs further from scientific truth than one's conscience can approve, and more frequently ties himself in grammatical knots. On page 25 we read: " If the power is only on for a short time with a small load it gives a very high temperature rise." A little further down the same page: " When the assembly is very thin the material is heated evenly throughout. The surface is giving up heat to the electrodes . . . and this causes the surface to be cooler than the interior. As there is only a small volume being heated, however, the temperature gradient is very great."

Many descriptions and explanations suffer from such

complexities: on page 116 "Every other electrode protrudes from one side, while the remaining electrodes protrude from the other side, the ones not coming out on one particular side ending flush with that side of the jig and having about 1in protruding from the other side. All the ends on each side are then connected. . . ."

Could a final word be said about that useless imported phrase "etc."? It appears 42 times in this book (the record being three times in four lines on page 113) and it does not really earn its place once. Annoying too, are the solecisms engendered by a too fluid use of the abbreviation R.F.—"R.F. Jig," "two pairs outside the R.F.," "making robe-ends with R.F.," and even, in one place, "R.F. frequencies."—O.C.H.

Mexico's Electrical Imports

THE foreign trade policy of Mexico is linked with her programme of economic and industrial development which, to make her less dependent on foreign supply sources, includes a local manufacturing programme.

This development has been encouraged by the rapid growth of electricity generation and consumption. A number of United States firms have formed joint enterprises with Mexican manufacturers to produce motors, transformers, switchgear, meters, cables, domestic appliances, lamps, fittings and radio receivers.

According to recent statistics, Mexico, with a figure of 12 per cent, has the highest annual rate of electric power progress of any nation in the American continent. The consumption per capita in Mexico increased from 116 kWh in 1940 to 253 kWh in 1956.

The installed capacity of generating plant in Mexico last year was 2,200 MW, of which 48 per cent consisted of hydro-electric, 41 per cent thermal, 10 per cent diesel and the rest other internal combustion. Public utilities accounted for 75 per cent of the total capacity, private plants for 19 per cent, the rest being private plants used for the public supply system.

The principal supply systems are: Cia Mexicana de Luz y Fuerza Motriz S.A., Cia Impulsora de Empresas Electricas, Commision Federal de Electricidad (C.F.E.) and the Nueva Cia Electrica Chapala S.A. The latest development plan envisages an installed capacity of over 3,000 MW and an annual output of 11,000 million kWh by the end of 1959. By this time $500 million should have been spent on generation, transmission and distribution, about half of it on imported equipment.

Last year was one of remarkable economic growth and foreign trade reached record levels particularly in capital goods to improve Mexico's agricultural and industrial production.

The United States is Mexico's best market and her principal supplier and Mexico is consequently highly sensitive to any recession of economic activity of her northern neighbour. This is one of the reasons why Mexico is anxious to find new markets and suppliers. After the United States come Sweden, West Germany, Italy and, in fifth place, the United Kingdom. Mexico's electrical imports last year were valued at £22·3 million (£16·9 million in 1955) and were made up as follows: United States £17·1 million (£12·8 million); West Germany £1·1 million (£1 million); Italy £1 million (£0·9 million); Sweden £1·5 million (£0·9 million); and the United Kingdom £0·8 million (£0·5 million). Although the United Kingdom's exports to Mexico show an encouraging increase of 60 per cent the predominance of the Continental competitors is obvious.

The large sums allocated to power development in the budget, as well as loans from the World Bank and Export-Import Bank and other foreign credits and loans, should all help to realise Mexico's ambitious power expansion schemes.

IMPORTS IN 1956 (Values in 000 pesos. £1 = 35 pesos)

Product	Value
Turbines of all kinds	5,273
From United Kingdom	5
,, West Germany	1,025
,, United States	244
,, Switzerland	3,998
Generators and dynamos	26,226
From United Kingdom	541
,, West Germany	9,289
,, Austria	1,513
,, United States	12,744
Motors, up to 2 kg	1,054
From United Kingdom	169
,, United States	783
Ditto, above 2 kg	16,998
From United Kingdom	935
,, United States	10,451
,, Italy	4,529
,, West Germany	620
Controllers, commutators and interruptors up to 2 kg	1,569*
Ditto above 2 kg	10,453
From United States	7,302
,, Italy	2,468
Switchboards up to 75 kg	190*
Ditto, above 75 kg	3,251
From United States	2,920
,, Italy	291
Transformers, up to 30,000 kg	10,917
From United Kingdom	29
,, West Germany	149
,, United States	8,604
,, Holland	177
,, Italy	1,734
Ditto, above 30,000 kg	2,230*
Fuses	1,970*
Insulators	12,160
From United States	10,746
,, Japan	1,064
Transmission line pylons	7,507
From United Kingdom	2,030
,, Italy	5,419
Capacitors	17,401
From United Kingdom	593
,, United States	14,005
,, Holland	1,260
Resistors	2,079
From United Kingdom	123
,, United States	1,671
,, Canada	210
Accumulators	4,373
From United Kingdom	107
,, United States	3,229
Dry cells	1,771*
Wet cells	111*
Ballasts, reactors, or transformers for fluorescent lamps weighing more than 5 kg	4,909*
Lamps, gas filled, mercury vapour and n.e.s.	2,059*
Lamps, filament up to 50 grms	1,400
From United States	700
,, Japan	120
,, Holland	363
Ditto, above 50 grms	1,128*
Telephone apparatus	17,801
From United Kingdom	121
,, United States	6,046
,, Belgium	3,829
,, Sweden	6,397
Intercommunication apparatus	9,067
From United Kingdom	493
,, United States	2,833
,, Belgium	2,447
,, West Germany	1,044
,, Sweden	1,857
Telegraph apparatus	2,242
From France	1,057
,, United States	520
Radio transmitting equipment	5,728
From United Kingdom	355
,, United States	4,911
,, Holland	458
Radio receivers, with cabinets	332*
Ditto, without cabinets, chassis and components	767*
Radio telephone apparatus and components	9,118
From United Kingdom	1,387
,, United States	3,736
,, France	3,979
Sleeves and junction boxes	1,704*
Insulating tubing	2,020
From United Kingdom	72
,, United States	1,846
Installation material, n.e.s.	17,451
From United Kingdom	244
,, United States	15,063
,, Italy	755
Cables and wires	34,055
From United Kingdom	6,261
,, United States	18,707
,, Sweden	1,835
Cookers	438*
Heaters, n.e.s.	2,770*
Fans and ventilators	7,656
From West Germany	168
,, United States	6,407
,, Italy	400
,, Sweden	377
Beaters, mixers and other motor-driven kitchen utensils, n.e.s.	2,089*
Ovens and toasters	548*
Vacuum cleaners	2,935
From United States	719
,, France	902
,, Holland	241
,, Sweden	975
Hair waving, curling and drying apparatus, hair clippers	1,336*
Dry shavers	873
From Holland	422
,, United States	351

* Mainly from the United States.

Measuring Techniques and Automation

International Congress and Exhibition at Düsseldorf

FROM A CORRESPONDENT

FROM 2nd to 10th November an International Congress and Exhibition on Measuring Techniques and Automation was held at Düsseldorf, West Germany, and if an attendance at an international gathering may be taken as an indication of the interest being shown in the subject matter with which it is concerned, technical and scientific measurements and automatic controls must at the present time be very topical indeed.

The Congress was organised jointly by the engineering institutions of West Germany primarily concerned with measurements and controls in industrial processes, that is the Association of German Electrical Engineers (UDE), the Association of German Mechanical Engineers (VDI), and the Association of Steel Plant Engineers (VDEh), together with the Measuring and Control Techniques Standardisation Committee of the German Chemical Industry (NAMUR).

Associated with the Congress and forming a most important part of the arrangements, was an extensive exhibition of measuring and control equipment sponsored by the German Precision Mechanics and Optical Industries Association, the Central Electrical Industries Association (ZVEI) and the Association of German Electricity Supply Undertakings (VDEW).

Overseas Participation

Both the Congress and the Exhibition, although on a larger scale, were in many ways similar to the Instruments, Electronics and Automation Exhibition held earlier in the year at Olympia, but whilst the British event was primarily a national exhibition with which was associated a course of lectures by British authors, the German event was organised under the name of Interkama, 1957, as the first international congress on measuring techniques and automation and endowed with all the attributes and facilities, including simultaneous interpretation in English, French and Russian, normally associated only with the larger international congresses. The papers presented were mainly by German authors, but there was also one paper each by authors from seven other countries, including the U.S.A. and the U.S.S.R.

The Exhibition, which covered an area of over 250,000 sq ft, was dominated by German manufacturers although of the 330 exhibiting firms there were about 150 from eleven other countries, including the U.S.A. and Canada. These were mainly grouped in national sections, the most prominent of which were those of France and Italy. Scientific Instrument Makers' Association also had a stand where equipment was shown from some 20 British firms.

The Congress was opened by Professor Dr. R. Vieweg, president of the Federal Physical-Technical Institute, and the papers of the first part of the Congress included one by S. Ekefalk, deputy chairman of the Swedish State Power Board, who spoke on the need for automatic regulation and control in the electricity supply industry, with particular reference to the conditions in Sweden; another paper in this group was presented by J. Weill of France who spoke on the principles governing the behaviour of a nuclear reactor on the basis of its kinetic equation as well as the equations for the thermo-dynamic system. The author discussed some of the control equipment used in French experimental and power reactors.

Amongst the papers presented during the following specialist working sessions was one by O. Winkler which dealt with automation in the chemical industry with particular emphasis on the pneumatic transmission of signals, and another by W. Pepperhoff on temperature measurement and control in the iron and steel industry.

Cable Fault Location

Of particular interest to the electricity supply industry was a paper by H. Wechsung on modern test sets for fault location on power distribution cables. It described in detail two novel methods for accurately locating intermittent faults which are based on the speed of impulse propagation, one of these methods having been developed by the Hamburg Electricity Works and the other jointly by the author and a German instrument manufacturer; whilst the former method appears to be generally the better of the two, the latter is particularly useful for use with oil-filled cables.

Other papers dealt with automatic controls in telecommunications, and in particular with various methods for maintaining a constant supply voltage, including the use of transistor circuits and magnetic amplifiers.

The working session on the control of steam boilers for power stations dealt in particular with the electro-pneumatic control of steam boilers and with load frequency control. Two papers discussed the control of the steam temperature by means of flue gas dampers; a further paper by G. Pahl dealt with supplementary stresses in steam turbines due to rapid load fluctuations and in particular during starting up.

Reverting to the Exhibition, it is impossible to describe within the limits of this article all the novel or interesting exhibits shown and the following few items have been chosen at random from a great number of instruments which could usefully have been mentioned. There was, for instance, an industrial portable X-ray unit for testing materials which was combined with an image amplifier and television transmitter and receiver, allowing remote non-destructive testing.

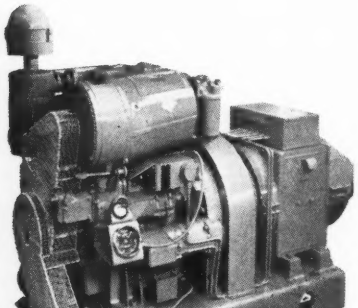
Another novel instrument shown was a limit switch for containers of solid materials, such as coal hoppers, using the capacitance in a probe as the controlling factor.

Air pollution is a topical problem also in Germany and amongst the instruments developed for testing the purity of the atmosphere was a SO_2 recorder which measures minute traces of this gas in the atmosphere. This apparatus, which is based on the enrichment of a very weak solution of H_2SO_4 by bringing small doses of this into intimate contact with measured quantities of air, and measures the change of electrical conductivity of that solution, has been in use for some time in a survey to determine the SO_2 content of the atmosphere in various parts of Germany. One of the outstanding features of the Exhibition was the considerable number of digital computers, calculating machines, and similar equipment.

Diesel-Electric Control Unit

A DIESEL-ELECTRIC unit known as RACO ("rapid automatic change-over"), designed for controlling generating sets in unmanned repeater stations is now available from J. & H. McLaren, Ltd., of Leeds. Its applications are divided into two main classes. First it ensures that, in the event of power failure, the load will be taken over with the minimum of delay. Second, where it is essential that there shall be no break in the continuity of full electric power supply, a RACO continuity set will provide uninterrupted service.

In the field of telecommunications the control gear is designed so that any break in supply is either less than three milliseconds or more than ten seconds. By means of a special switching system load can be transferred from one power source to another with an interruption adjustable down to two milliseconds. Generating sets employing this system may be used as a direct source of power for radio equipment and ancillary service or, where a no-break power supply is essential, as the source of an energy storage system. In either application the control gear is the same and is arranged for assembling on a unit system.



Mains failure or duplicate set, with Petter McLaren PD2 engine and RACO control equipment; capacity 7½–14 kW at 1,000 to 1,800 r.p.m.

The basic unit is a dust-proof, wall mounting cubicle containing all the contactors, relays, etc., necessary to start and stop the generating set when given the necessary impulse from an external source. The cubicle also contains all fault detecting and signalling apparatus for its particular generating set. If the set is on mains stand-by duty, the control panel is energised from a change-over panel which contains the mains failure detector relays, load transfer contactors, trickle charger, instruments, manual and automatic switches, isolating switch and provision for supervisory and remote radio control. As an even greater safeguard, the change-over panel can be made to govern two sets via control panels. In this case, if one set fails to start on demand, or develops a running fault, the whole sequence of operation is transferred to the second set.

In a station where no mains are available, dual or triple generating sets are installed, each with its own control panel. Two sets are arranged to operate on a 72-hour cycle basis. If a fault occurs on one set, the duty is transferred to the other. In triple installations a pair of sets normally shares the duty cycle with a third set used permanently as a stand-by. Under fault conditions on either of the duty sets, the operating sequence is automatically diverted to the third set. The cyclic time switch, change-over contactors, trickle charger, instruments, manual, automatic and isolating switches, and provision for remote radio control are all accommodated in a separate dust-proof wall mounting unit called a timer cubicle.

On the RACO sets the alternators used are of the standard Brush "Square Path" type, except that they meet a more stringent specification than is usual with these machines for voltage regulation, wave form and interference suppression. The voltage regulation is maintained within ±2½ per cent of the nominal value for power factors ranging from 0·9 to unity.

Air-cooled diesel engines are used in all cases; up to 6 kW the Petter AVA1 or AVA2 types and in the range 7·5 to 63 kW the Petter McLaren PD or PDV engines.

The new diesel-electric unit may be converted to a no-break system by using a continuity unit. This consists of an induction motor, heavy flywheel, and alternator, all mounted on a common bedplate. The motor is of the low slip type and is normally driven from the mains (or by the duty set in a no-mains station). The alternator is driven through the flywheel and forms the permanent source of supply to the radio equipment and essential services.

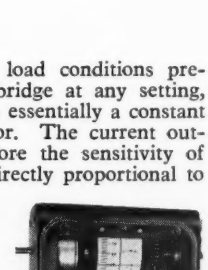
The machines are usually three-phase and they may be arranged for any voltage or frequency, the generating set being wired accordingly. The flywheels are designed to maintain the nominal frequency within close limits for a period of ten seconds with the alternator on full load. Because of its inertia the continuity unit tends to smooth out fluctuations in both frequency and voltage of indifferent mains supply.

Safety Ohmmeter

A PHOTO-ELECTRIC safety ohmmeter for use in the testing of firing circuits has recently been developed by the Weapon Division of the Fairey Aviation Co., Ltd. By using a selenium photo-cell as the power source for a resistance bridge, there is no risk of dangerously high currents being introduced into the firing circuit.

The instrument utilises a Wheatstone bridge, providing a range of resistance measurement from 0 to 10 kΩ in four switched ranges (0-10 Ω, 0-100 Ω, 0-1 kΩ, 0-10 kΩ). A "transit" position on the switch is arranged to place a short-circuit across the meter terminals for galvanometer damping. The power source for the bridge is a high sensitivity infra-red selenium photo-cell, the characteristics of which are modified in manufacture to limit the short-circuit current of the cell at light saturation, and yet maintain a high sensitivity at low illumination intensities. Null indication is provided by a sensitive centre-zero galvanometer, the pole pieces of which are shaped for off-balance insensitivity.

The fundamental bridge accuracy (determined by component tolerances) is of the order of ±0·3 per cent. The measurement accuracy, however, is dependent upon the sensitivity of measurement and the scale reading accuracy. At low illumination intensities (i.e. below 50 ft-candles), and under the load conditions presented by the bridge at any setting, the photo-cell is essentially a constant current generator. The current output, and therefore the sensitivity of the bridge, is directly proportional to the intensity of the light incident on the photo-cell.



Fairey photo-electric safety ohmmeter sealed inner case with components in position

High scale reading accuracy is ensured by the use of a precision cam-corrected potentiometer, wired as a variable resistance, and an accurately graduated scale drum. This has an effective scale length of 6·5in for 100 divisions. Backlash is eliminated by fixing the scale drum directly to the driving shaft of the potentiometer. The overall dimensions of the instrument are 11½in by 7in by 4in and its weight is approximately 8½ lb.

GENERATION AND DEVELOPMENT

Consumers' Representations

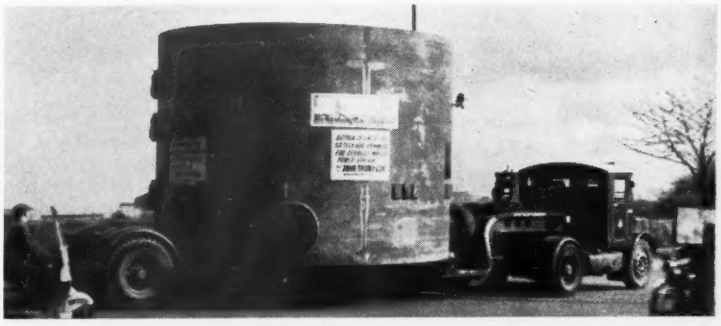
A complaint recently considered by the Mid-Sussex District Committee of the South Eastern Electricity Consultative Council concerned the erection of an overhead line which, it was alleged, broke a promise made by the Board. A consumer said he had paid £154 for the service cable to his house to be laid underground and alleged that the Board had promised to take any future supply to premises east of his house from that side so as not to go across the front of his house. The Board denied making such a promise and the Committee informed the consumer that there was no evidence of any undertaking having been given. It was pointed out by the Board that the route chosen was shorter and meant that smaller capital contributions were required.

Another representation related to the tariff for electricity supply to a mutual household comprising five self-contained apartments, eight almshouse standard apartments, five hostel type rooms, and staff rooms, etc. The consumer maintained that this was a private dwelling and should be supplied at the domestic tariff rate. The Board, however, insisted that this was not applicable. In view of the provisions of the new installed load tariff which comes into operation next April the Committee agreed not to make any representations but suggested that the Board should be invited to provide some information on the load curves and characteristics of such property so that the Council might be satisfied that the special provision in the new tariff was in fact right and proper.

Encouraging Off-Peak Supplies

Responding to the toast of "The Nuclear Future" at the annual dinner of the Bristol Junior Chamber of Commerce on 1st November, Mr. A. N. Irens, chairman of the South Western Electricity Board, said they could only obtain the full benefits of nuclear energy by making the most efficient use of these costly new assets. The whole of their thinking on charges and tariffs in the South West was based on how to encourage higher load factors, partly by building up a domestic load with good diversity and partly by encouraging the transfer of industrial and commercial heating and power loads to off-peak periods. The field for development of off-peak load was tremendous. Three months ago they made cheaper rates available for electricity used during off-peak periods and their success with some of the bigger industrial consumers had been considerable. Hundreds of West Country shops, offices, stores and workshops had taken advantage of cheap off-peak supplies to heat their premises by means of simple automatically controlled storage heaters and floor-warming systems.

Referring to atomic developments, Mr. Irens said his personal view was that there was also a distinct possibility for the future that heat from nuclear reactors might be used for gas production. "It is only a personal opinion, but I can visualise nuclear stations producing both electricity and gas."



Top section of one of the five 17ft 6in diameter cylindrical body sections which, with top and bottom domes, comprise a complete heat exchanger vessel, being transported from John Thompson's Wolverhampton works to the Central Electricity Authority's 275 MW nuclear power station at Berkeley. To each of Berkeley's two reactor vessels there are eight heat exchangers

Route of Supergrid Line

Discussions have taken place between Jarrow Town Council and the Central Electricity Authority regarding the proposed construction of a 275 kV transmission line in the area. The Authority has agreed to consider a suggestion that the line should be carried along the south side of Jarrow Slake into South Shields, where it could follow the route of the South Shields-Sunderland branch railway line into Sunderland.

Inquiry into North Wales Nuclear Project

The Minister of Power has decided to hold a public local inquiry into a proposal of the Central Electricity Authority to build a nuclear power station at Trawsfynydd in North Wales. The proposed site is in the Snowdonia National Park. The date of the inquiry has not yet been fixed.

Fife Area Reorganisation

The South of Scotland Electricity Board has reorganised its Fife Area, combining engineering and commercial staffs on a district basis; at the same time districts have been reorganised with headquarters at Dunfermline and Cupar. The Eastern District office is now at Drum Road, Cupar, and the Western at Halbeath Road, Dunfermline. Headquarters will continue to be at Eastport, Dunfermline, where all major district business will be co-ordinated.

Profit from Trolley-Buses

South Shields Corporation Transport Department made a surplus of £6,289 in 1956-57. The trolley-buses earned a profit of £10,448, but there was a deficit of £4,159 on the motor-buses. Mr. J. Crawford, transport manager, reports that the year under review was a difficult one. The trolley-buses carried 1,250,000 fewer passengers than in the previous year, but as a result of higher fares revenue increased by over £12,000. Motor-buses, although carrying 719,000 more passengers, increased their revenue by only £15,634. Total revenue for the undertaking was £408,146.

Loan for Cookers Deferred

Durham R.D.C. has received loan sanction for £5,000 for the purchase of electric cookers, but owing to the increased borrowing rate it is not proposed to raise the loan for the time being.

Street Lighting

An £8,500 public lighting system installed by Siemens Edison Swan, Ltd., at **Banbridge**, Northern Ireland, includes both "Kuwait" and "Cathay" lanterns, examples of which can be seen in the accompanying photograph. For class "A" street lighting the 5ft "Kuwait" lanterns house two 80 W fluorescent tubes and for class "B" lighting there are 2ft designs with two 40 W tubes. The post-top decorative "Cathay" lanterns are used on the Downshire and Water Bridge.

Rhyl U.D.C. proposes to extend the new lighting on the Coast Road to the Foryd bridge and the Ministry of Housing and Local Government is being asked to expedite the issue of consent to a loan of £7,150 for the purpose.

Stockton-on-Tees Town Council has received loan sanction for £4,779 for the provision of street lighting along trunk roads A.19 and A.67.

Darlington Finance Committee is considering a proposal to finance a £2,350 scheme for street lighting on the Nickstream Lane estate out of revenue.

Financial Section

STOCKS and SHARES

INDUSTRIAL markets of the Stock Exchange had acquired a steadier appearance by the beginning of this week. Prices had been lifted a little clear of the levels recorded at the start of the month, when the averages were at their lowest for three and a half years. Most industrial ordinary shares have lost 20 per cent, and many as much as 30 per cent, of their value in the course of the past five or six months alone. Depreciation of this order has effectively discouraged further selling, even if it has not yet persuaded buyers to turn out in any large numbers in circumstances which continue to provide plenty of excuses for staying away. Of these, the matter of wage claims seems likely to remain influential for some time to come; and meanwhile evidence accumulates, in company reports, that orders and earnings are both becoming more difficult to secure in some branches of industry. All the same, it has been possible for dealers in industrial shares to detect a perceptible improvement in the tone of the market.

Price Changes

Among electrical shares, recent price movements have again been rather small and irregular, but with a general tendency to move away from the bottom. Of the leaders, G.E.C. recovered half-a-crown to 41s 3d, while A.E.I. and English Electric each regained 1s 3d to the common level of 50s, and Crompton Parkinson rose to 15s. Others to pick up some of previous losses included C. A. Parsons, Allen West, Decca, Babcocks and British Aluminium. Joseph Lucas were well supported in advance of the final dividend declaration. Some of the cable manufacturers' shares, however, recorded new low points, largely because of continued concern over the possibility of stock losses in the accounts for the current year. Ericsson Telephones were quoted ex-the 100 per cent scrip issue, and gained a few pence to 19s 3d. Assuming that this operation will halve the rate of the ordinary dividend, the shares are on a yield basis of a fraction over 2¾ per cent net, equivalent to nearly 5 per cent, subject to tax.

Company News

A rise of 1s 6d to 14s 6d in the price of S. Smith & Sons (England) 4s shares registered satisfaction with the company's announcement of increases in the earnings and the dividend for the year ended in July, and of a proposed 100 per cent scrip issue. Group profits at £2·8 million are shown in the preliminary statement of the results to be half a million higher than those of the previous year, which had been considerably affected by recession in the motor industry. In advance of the full report it is assumed that the subsequent recovery in that field will have been a large factor in the revival of S. Smith's earnings. Tax charges have risen some £400,000 to more than £1½ million, but the net surplus of £1¼ million comes out £90,000 to the good

Price Changes in

Company or Board	Nom. Value	Middle price 11th Nov.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
						£ s d		
Gilt-edged Stocks								
Brit. Elec. 1968/73	100	71		3	3	4 4 6	80	70
Brit. Elec. 1974/77	100	67½		3	3	4 9 0	78½	66
Brit. Elec. 1976/79	100	70½		3½	3½	4 19 3	81½	70
Brit. Elec. 1974/79	100	81½	+½	4¼	4¼	5 4 3	92½	79½
Overseas Electric Supply								
Calcutta Elec.	£1	16/6		6†	6·8†	8 4 9†	19/-	15/-
East African Power	£1	20/-	+6d	7	7½	7 10 0	21/-	19/-
Nigerian Elec.	£1	16/6		10	10	12 2 6	18/6	16/6
Perak Hydro-Elec.	£1	16/-		10	12½	15 12 6	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	10/3		17½	17½	8 10 9	12/6	9/9
Aerialite	1/-	5/6		48	51½	9 7 3	6/9	4/9
Allen, W. H.	£1	36/9	−1/6	10	10	5 8 9	47/3	33/6
Anglo-Portuguese Tel.	£1	21/3		8	8	7 10 6	27/6	20/6
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	60/-	53/6
Assoc. Elec. Ord.	£1	51/3	+1/3	15	15	5 17 0	73/-	49/6
Automatic Tel. & El.	£1	58/9	−1/3	15	17	5 15 9	75/-	54/6
Babcock & Wilcox	£1	57/-	+9d	15	15	5 5 3	82/6	54/9
Bakelite	10/-	22/3	+1/-	16	15	6 14 9	24/6	20/9
Baldwin, H. J.	2/-	4/-	−3d	20	20	10 0 0	5/-	3/10½
Berry's Electric	5/-	6/-	+3d	—	10	8 6 9	6/6	5/6
British Aluminium	£1	40/-	+1/3	12	12	6 0 0	71/3	38/9
Brit. Elec. Traction: Def Ord "A"	5/-	18/6	+6d	22½	25	6 15 3	25/-	17/-
B.I. Callender's	£1	41/-	−6d	12½	12½	6 2 0	55/-	40/9
B.I. Callender's 6% Pref.	£1	20/-		6	6	6 0 0	21/9	19/-
British Tabulating	£1	37/6	−6d	9	9	4 16 0	56/3	38/3
British Thermostat	5/-	21/3	−1/3	25	25	5 17 9	27/6	22/6
British Vac. Cleaner	5/-	5/-		15	10	10 0 0	8/-	5/-
Brook Motors	10/-	32/6	−1/3	25	25	7 13 9	37/6	30/-
Bulgin, A. F.	1/-	4/6		50	40*	8 17 9	5/6	4/-
Burco Dean	5/-	11/6	+3d	22½	20	8 14 0	14/-	8/9
Cable & Wireless: Ord.	5/-	9/6		10	10	5 5 3	12/6	9/6
4% Loan	100	91½		4	4	4 7 6	92½	89
Chloride El. Storage "A"	£1	57/-	+1/3	17½	17½	6 2 9	68/9	55/9
Clarke Chapman	£1	118/9	−2/6	22½	27½	4 12 6	9	5⅞
Cole, E. K	5/-	16/6		17½	17½	5 6 0	23/6	16/6
Cossor, A. C.	5/-	5/3		Nil	2½	2 7 6	7/3	5/-
Crabtree	10/-	23/9		20	20	8 8 6	26/-	23/3
Crompton Parkinson Ord.	5/-	15/-	+1/-	16	16	5 6 9	17/9	14/-
De La Rue	5/-	21/9	+6d	30	35	8 1 0	24/9	16/3
Decca "A"	4/-	22/6	+6d	43¾	43¾	7 15 6	32/3	22/-
Desoutter	5/-	32/6	−1/-	30	32½	5 0 0	35/6	27/6
Dewhurst	2/-	6/6		30	16½*	5 0 0	7/9	5/9
Dictograph Tel.	2/-	5/9	+3d	20	20*	6 19 3	6/3	5/3
Dubilier Condenser	1/-	3/-		30	30	—	8/1½	3/3
Duport	5/-	17/-		23	25	7 7 0	21/-	17/-
E.M.I.	10/-	26/6	+6d	15	15	5 13 3	36/-	23/9
Electrical Components	5/-	7/3		25	12½*	8 12 6	8/-	6/6
Elec. Construction	£1	23/9		8½	8½	7 3 3	27/6	21/9
Elliott-Automation	5/-	12/6		—	10‡	4 0 0	12/6	10/3
Enfield Cable Ord.	£1	13/6		Nil	Nil	Nil	21/6	13/-
English Electric	£1	51/3	+1/3	12½	14	5 9 6	65/-	47/6
English Electric 3¾% Pref.	£1	12/3		3¾	3¾	6 2 6	14/3	11/3
Ericsson Tel.	5/-	19/6x.c.	+6d	20†	22†	2 16 6*†	25/-	17/-
Ever Ready	5/-	15/3		35	37½	6 3 0*	20/-	14/3
Falk Stadelmann	£1	36/3	+1/3	17½	17½	9 13 0	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

and exceeds by some 3½ times the amount of the ordinary dividend. The improvement in the latter from a total of 17½ per cent to 20 per cent brings the yield on the shares to 5½ per cent. Desoutter Bros. 5s shares were called 32s 6d after the company's announcement of a coming one-for-one share distribution.

Aerialite Dividend

During the market upsets of recent months, Aerialite 1s shares have been comparatively well sustained by anticipations of good annual results, which have materialised now in the statement covering the twelve months to May last. Another substantial improvement in earnings is reported, and provides very comfortably for an increase in the dividend to a total of 51½ per cent, which compares with the rate of 48 per cent to which it was raised a year ago. The interim dividend had been raised by a point in May. In spite of a much heavier tax charge the group net profit of £179,000 comes out nearly a quarter above the previous figure. The yield on the 1s shares at 5s 6d goes up to close on 9½ per cent, on the basis of a dividend covered almost three times by net earnings.

Electrical Investments

Company or Board	Nom. Value	Middle price 11th Nov.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Electrical Shares—continued						£ s d		
G.E.C. Ord.	£1	41/3	+2/6	14	12½	6 1 3	58/9	38/9
G.E.C. 6½ Pref.	£1	20/-		6½	6½	6 10 0	23/6	19/6
General Cables	5/-	12/6		30	30	12 0 0	15/6	11/6
Greenwood & Batley	£1	47/-	−3/-	17½	17½	7 9 0	51/3	45/3
Hackbridge Holdings	5/-	11/3	−1/-	30	20	8 17 9	21/9	11/3
Hackbridge & Hewittic	5/-	10/-		23	20	10 0 0	16/-	10/-
Head Wrightson	5/-	16/6		20	22½	—	24/3	16/6
Heatrae	2/-	4/9		15	15	6 6 6	4/9	4/-
Henley's	10/-	11/3	−6d	11½	11½	10 4 6	17/-	11/3
Holophane	5/-	21/9	−3d	30	37½	8 12 3	26/3	17/-
Hoover	5/-	28/6	−1/6	50	50	8 15 6	44/-	24/9
I.C.I.	£1	38/-	+1/6	10	10	5 5 3	46/6	36/3
Intl. Combustion	5/-	20/-		20	22½	5 10 0	30/-	19/3
Johnson & Phillips	£1	19/3	+6d	15	10	10 7 9	34/6	18/9
Lancashire Dynamo	£1	35/-		11	11	6 5 9	45/9	33/6
Laurence, Scott	5/-	14/3		15	15	5 5 3	19/9	13/9
Lister, R. A.	£1	23/3		10	10	8 12 0	33/9	23/3
London Elec. Wire	£1	40/9		12½	12½	6 2 9	53/9	40/9
Lucas, J.	£1	30/-	+1/9	7½	7½	5 0 0	36/6	27/6
Marconi Marine	£1	31/3	−1/9	10	10	6 8 0	37/-	31/-
Marryat & Scott	2/-	10/6		30	35	6 13 3	13/-	8/-
Mather & Platt	£1	47/-	−1/9	15	15	6 7 9	63/9	47/-
Metal Industries	£1	22/9	−6d	Nil	9	7 18 3	30/-	20/3
Midland Elec. Mfg.	£1	47/6		12½	12½	5 5 3	52/6	45/-
Morphy-Richards	4/-	15/-		50	20*	5 6 9	20/-	11/6
Murex	£1	57/-		20	20	7 0 3	79/6	58/3
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/1
Oldham & Son	1/-	2/6		17½	17½	7 0 0	3/-	2/3
Parnall (Yate)	5/-	6/-		12	12	10 0 0	8/9	5/9
Parsons, C. A.	£1	47/6	+1/3	8½	7½*‡	—	71/3	45/-
Plessey	10/-	65/-		27½	30	4 12 3	86/3	61/-
Pye "A" Deferred	5/-	12/6		12½	12½	5 0 0	20/-	12/-
Reyrolle	£1	73/9		16½	17½	4 15 0	110/-	72/-
Rheostatic	4/-	7/-		18½	12½*	7 2 9	10/-	7/-
Richardsons Westgarth	5/-	13/9		16⅝	16⅝	6 1 3	20/-	13/6
Scottish Cables	4/-	14/3		27½	27½	7 14 6	19/3	14/-
Simon-Carves	5/-	23/9		28½	20*	4 4 3	36/3	23/9
Smith (England), S.	4/-	14/6	+1/6	17½	20	5 10 3	16/-	12/9
Southern Areas	£1	11/3		7½	7½	13 6 9	20/-	11/3
Strand Elec.	5/-	5/9		15	15	13 0 6	8/-	5/9
Sturtevant	5/-	18/6	−1/-	15†	15†	4 1 0†	27/-	18/6
Sun Elec.	£1	43/9		25	25	11 8 6	45/-	42/-
Switchgear & Cowans	5/-	10/3		25	25	12 4 0	15/6	10/3
Taylor Tunnicliff	5/-	11/9		15	15	6 7 9	13/9	11/9
T.C.C.	10/-	37/6		25	25	6 13 3	41/3	35/-
T.C. & M.	£1	24/-		8½	8½	7 1 9	31/-	24/-
Telephone Mfg.	5/-	5/6		10	10	9 1 9	8/-	5/3
Telephone Rentals	5/-	9/6	−6d	12½	12½	6 11 6	12/6	9/6
Thompson (John)	5/-	24/-		25	25	5 4 3	37/-	23/6
Thorn Elec.	5/-	20/-		15	17½	4 7 6	26/3	16/3
Thornycroft	£1	25/-	+2/6	12½	12½	10 0 0	37/6	21/3
Tube Investments	£1	51/3	−9d	13¾	15	5 17 0	70/-	51/3
Vactric	5/-	15/9		17½	25	7 18 9	23/9	12/9
Veritys	5/-	7/9		12½	12½	8 1 3	9/3	7/9
Walsall Conduits	4/-	11/-		20	20	7 5 6	15/-	11/-
Ward & Goldstone	5/-	24/-	+1/-	35	40	4 3 3*	29/-	18/6
Watford	2/-	5/9	−6d	25	25	8 13 9	6/9	5/9
Westinghouse	£1	30/-		18	9‡	6 0 0	41/3	28/9
West, Allen	5/-	9/9	+3d	15	15	—	13/6	9/6
Wolf Electric	5/-	9/-		20	20	5 11 0*	13/9	8/9

Tube Investments

Market reactions to the excellent figures in the Tube Investments preliminary statement of the annual results were tempered by references in it to signs of deterioration in current trading conditions. For the twelve months ended in July, the group trading profits expanded by a million to £15·6 million. A final dividend of 7½ per cent makes the expected total of 15 per cent (against 13¾ per cent previously) for the year, and although increased charges for depreciation and taxation bring the net surplus down to £5½ million, this leaves three-quarters of the profit to be ploughed back into the business. After some fluctuation, the £1 shares were little changed at 51s 3d.

Peto Scott Proposals

Peto Scott 1s shares have been dealt in at a little under 3s since the appearance of the annual report and details of the proposals whereby the company would come under the control of Pena Copper Mines, who already own a large shareholding. The merger proposals are recommended by the directors for acceptance. Under the scheme, Peto Scott is to acquire the Conrad Electrical Co., issuing 540,000 shares of 1s to the vendors, who may exchange them for shares in Pena Copper at the rate of one 6s 8d preference share (valued at par) and one 6s 8d ordinary share (valued at 15s) of Pena for every six Peto Scott 1s shares (valued at 3s). These terms would then be offered to other Peto Scott shareholders after the meeting to be held on the 22nd of this month.

Dictograph Results

Dictograph Telephones are fulfilling expectations in maintaining the ordinary dividend for 1956–57 at a total of 20 per cent, the same rate as before but applicable to capital increased to £375,000 as a result of this year's one-for-four scrip issue. There was a similar sequence of events five years ago on the occasion of a 20 per cent share distribution. Trading profits improved by over 10 per cent, and the net surplus of £95,000 is up to the previous figure. Quoted at 5s 9d, the 2s shares are on a yield basis of nearly 7 per cent.

REPORTS and DIVIDENDS

Falk, Stadelmann & Co., Ltd.—The main figures in the accounts for the year ended 30th June last were given in our last issue. In his review of the year, which has been circulated with the report and accounts, Mr. H. Falk (chairman and managing director) says that the turnover of the parent company showed a significant increase although rising costs reduced net profit margins. The Lighting Fittings Departments continued in their strong position and they secured many important contracts, including the contract for the relighting by cold cathode fluorescent lamps of the dials of the "Big Ben" clock on the Houses of Parliament. The domestic appliance section continued to make steady progress. The range of electric fires and convectors has been increased and in addition they have placed on the market an electric safety blanket under the name of "Sleep-Safe," which has received the approval of the B.S.I. The factories engaged in light electrical switchgear and accessories have been reorganised, and with the introduction of the "Snapfast" range of switches and other specialities in the field of electrical wiring accessories, they are again in the lead with these products generally. The high voltage switchgear subsidiary has again had a successful year. Several new types of switchgear were designed and some expansion of productive capacity is now taking place to enable the high level of demand to be met.

The cable factories have been affected by the unprecedented reduction in the price of copper, but the works were running at full capacity during the year and during the first six months of the current year output and sales have shown a satisfactory increase, especially in the export market. The subsidiary specialising in cold cathode lighting has made good progress, and new equipment, especially for the lamp manufacturing side, was brought into production during the year. Export sales of the group have again increased and overseas branches have made satisfactory progress.

With regard to the future, increasing competition has resulted in a drop in turnover in certain sections during the first six months of the current year, mainly in the heating appliances sections, but a large proportion of this fall has been made good by other sections of the business. This year marks the 75th anniversary of the formation of the company.

Camp Bird, Ltd.—In his review of the group's activities for the sixteen months ended 30th April last, Mr. J. Dalgleish (chairman) says that consolidated earnings for the sixteen months totalled £657,856, of which £108,077 was contributed by subsidiary trading companies "since acquisition" by Camp Bird. In 1955 the parent company earned £720,317, of which, however, £507,173 arose as profits on realisation of investments and £213,144 as "earned" income. For the sixteen months' period the parent company earned £514,271, of which only £75,847 was profit on realisation of investments and £438,324 was "earned" income. Mr. Dalgleish briefly reviews the activities of the various companies within the group, including the Hartley Baird Group, Creston Electric, Ltd., Tenaplas, Ltd., and the Limit Engineering Group, Ltd.

Tube Investments, Ltd., in a preliminary statement, reports that trading profits of subsidiary companies for the year to 31st July last amounted to £15,650,685, an increase of approximately £1,000,000, and after providing for depreciation and taxation, the group net profit is £5,510,909, as compared with £5,271,209 for the preceding year. It is proposed to pay a final dividend of 7½ per cent, making 15 per cent for the year (against 13¾ per cent). The directors state that during the first quarter of the current year there have been indications of a slackening in demand. The outlook is uncertain, but if the present trend continues it may involve some curtailment of operations.

Desoutter Brothers (Holdings), Ltd., proposes to make a scrip issue of 1,400,000 5s "A" ordinary shares on the basis of one share for every share held. The new shares will rank *pari passu* with the existing ordinary shares except that they are not to carry the right to vote. The directors state that the capitalisation is not to be construed as indicating any increase in the overall dividend payment for the current financial year.

S. Smith & Sons (England), Ltd.—The group profits for the year to 3rd August last amounted to £2,847,193, as compared with £2,333,495 for 1955-56. Taxation absorbs £1,569,577 and minority interests £22,092, leaving a group net balance of £1,255,524 (£1,166,963). It is proposed to pay a final dividend of 15 per cent (against 12½ per cent), making 20 per cent (17½ per cent) for the year.

The East African Power & Lighting Co., Ltd., has declared an interim dividend of 3 per cent (unchanged).

W. & T. Avery, Ltd., are paying an unchanged interim dividend of 5 per cent.

Pye (Ireland), Ltd., announces an interim dividend of 2 per cent (unchanged).

The Sun Electrical Co., Ltd., reports a profit for the year ended 30th April last of £60,001, as compared with £68,464 for the previous year. This figure is arrived at after providing £68,932 for taxation. General reserve receives £15,000 and the dividend distribution for the year is maintained at 25 per cent by a final dividend of 15 per cent and a bonus of 5 per cent. The balance carried forward is £149,383 (against £123,187 brought in).

G. & J. Weir, Ltd., have declared an interim dividend of 3¾ per cent (against 7½ per cent), on doubled capital.

The Telephone Manufacturing Co., Ltd., has declared an interim dividend of 2½ per cent (unchanged).

New Companies

Crosland, Ltd.—Registered 11th October. Capital £2,000. To acquire the business of factors and wholesalers of electrical products, carried on by Crosland, Ltd. (in liquidation) at 85, Bradford Road, Batley, Yorks, etc. Directors: M. A. E. Crosland, E. Haley, Mrs. Doris Crosland and S. Smith. Regd. office: 85, Bradford Road C., Batley.

J. & S. Electronics, Ltd.—Registered 18th October. Capital £10,000. To acquire the business of J. & S. Engineers carried on by T. J. Johnson, C. R. Smith and R. Palumbo at Power Works, Slade Green Road, Erith, Kent. Directors: T. J. Johnson, R. Palumbo and C. R. Smith. Regd. office: "Brooklands," 38, Bexley Lane, Crayford, Kent.

Rustil Electric Lamp Co., Ltd.—Registered in Edinburgh 1st August. Capital £100. Directors: R. S. Guthrie and J. M. S. Guthrie. Regd. office: 9a, West Maitland Street, Edinburgh.

Liquidations

Newports Electrics (Branksome), Ltd., electricians, 4, Park Terrace, Commercial Road, Parkstone, Poole.—Winding up voluntarily. Liquidator, Mr. A. Lloyd-Allen, 4, Park Terrace, Commercial Road, Parkstone, Poole, appointed 29th October.

A. Bastin & Co. (Electrical), Ltd., electrical contractors, 77, Barking Road, East Ham, London, E.6.—Winding up. Liquidator, Mr. A. C. R. Chapman, 147, Headley Drive, Ilford, Essex, appointed 26th October.

Dirks Electronic, Ltd., electronic engineers, 49, King Street, Manchester, 2.—Winding up voluntarily. Liquidator, Mr. J. Seal, Greenhalgh, Sharp & Co., 30, Brown Street, Manchester, 2, appointed 31st October.

Bankruptcies

L. Myers, 320, Rochdale Road, Collyhurst, Manchester, electrical wholesaler.—Receiving order made 30th October on debtor's own petition. Public examination 24th January at the Court House, Quay Street, Manchester.

C. Sykes, 10, High Kepplewray, Broughton-in-Furness, Lancs, electrician.—Trustee, Mr. D. Atkinson, 14, Lowther Street, Carlisle, Official Receiver, released 25th October.

A. E. R. Honey, 48, Bramerton Road, Beckenham, Kent, 117, Anerley Road, Penge, London, S.E.20, and formerly of 13, Longton Grove, Sydenham, London, S.E.26, carrying on business in partnership with another under the style of A. E. Honey, electrical contractor.—First dividend of 5s 6d in the £, payable at 8, Eccleston Square, London, S.W.1.

W. H. Hutson, K. W. Hutson and **P. Hutson,** trading in partnership under the style of W. H. Hutson & Sons, The Street, Littlebourne, Kent, saddlers, radio, cycle and electrical engineers.—Trustee, Mr. N. W. Osborne, 1, John Street, London, W.C.1, appointed 29th October.

A. S. F. Cracknell, Poultry Farm, Bath Road, West Dereham, Norfolk, lately residing at 253, Mersea Road, Colchester, as an electrical engineer under the style of Helier Electric (Colchester).—Last day for receiving proofs for dividend 19th November. Trustee, Mr. R. A. Paterson, Archdeacon House, Northgate Street, Ipswich.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 18th November

BATH.—South Western Electricity Board, 7 p.m. I.E.S. Bath and Bristol Centre. "What Do We Know About Lighting?", by R. J. Fothergill.

BIRMINGHAM.—Grand Hotel, 6.15 p.m. Birmingham Electric Club. "Live Lines in Electricity Distribution," by G. F. Peirson.

BRISTOL. — S.W.E.B. Demonstration Theatre, Electricity House, Colston Avenue, 6 p.m. I.E.E. Western Supply Group. "My Visit to the Soviet Union," by J. W. Bird.

DONCASTER.—The Danum Hotel, 7.30 p.m. Institution of Works Managers, Doncaster Branch. "Industrial Power in the Future," by F. M. Greenlees.

IPSWICH. — Electric House, 7.15 p.m. Ipswich and District Electrical Association. "I.E.E. Wiring Regulations," by Forbes Jackson.

LIVERPOOL.—At the Royal Institute, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Some Aspects of Half-Wave Magnetic Amplifiers," by G. M. Ettinger.

LONDON.—Café Royal, W.1, 6.30 for 7 p.m. The Dynamicables. Dinner.

MALVERN.—Winter Gardens. I.E.E. South Midland Centre district meeting. "Radio Research and the I.G.Y.", by Dr. Smith-Rose.

NEWCASTLE-UPON-TYNE. — King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. "An Analogue Computer for Nuclear Power Studies" and "The Application of Analogue Methods to Compute, and Predict Xenon Poisoning in a High-Flux Nuclear Reactor," by G. J. R. MacLusky.

STONE.—Duncan Hall, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "138 kV Submarine Power Cable Interconnection between the Mainland of British Columbia and Vancouver Island," by Dr. T. Ingledow, R. M. Fairfield, E. L. Davey, K. S. Brazier and J. N. Gibson.

Monday, 18th November, to Friday, 22nd November

LONDON.—New Hall, Royal Horticultural Society, Westminster. Medical Exhibition.

Tuesday, 19th November

BIRMINGHAM.—New Billesley Arms Hotel, Kings Heath, 7.30 p.m. A.S.E.E. Birmingham Branch. Dinner.

BURNLEY.—Staff Canteen, Lucas, Ltd., Wood Top Works, 7.45 p.m. I.E.E. Graduate and Student Section. "Application of Schlieren Photography to Ignition Problems," by K. D. Senior.

CAMBRIDGE.—Cavendish Laboratory, 8 p.m. I.E.E. East Anglian Sub-Centre. "Earth Electrode Systems for Large Electric Stations," by J. D. Humphries.

GLASGOW.—Grosvenor Restaurant, Gordon Street, 6 p.m. I.E.E. Scottish Centre. Annual dinner-dance.

Department of Natural Philosophy, University of Glasgow, 7.15 p.m. Institute of Physics, Scottish Branch. "Nuclear Power Production," by D. C. G. Smith.

LEEDS.—C.E.A., Yorkshire Div., 1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre. "Some Aspects of Heat-Pump Operation in Great Britain, with particular reference to the Shinfield Installation," by Miriam V. Griffith.

LIVERPOOL.—Liverpool Passenger Transport Office, 24, Hatton Garden, 6 p.m. I.E.S. Liverpool Centre. "Brains Trust."

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Utilisation Sections. Discussion on "The Measurement of the Dynamic Characteristics of Electrical Machines," opened by J. M. Layton, V. N. Manohar and R. A. Stevens. (Joint meeting.)

Magnet House, Kingsway, W.C.2, 6.30 p.m. A.S.E.E. London National Lecture, "Special Effect Lighting," by W. R. Stevens. (Joint meeting with the Institution of Engineers-in-Charge.)

LOUGHBOROUGH. — Loughborough College, 6.30 p.m. I.E.E. East Midland Centre. "Design for Production," by H. T. Price.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Measurement and Control Group. Discussion on "The Analysis of Wave Forms," opened by A. Cooper and D. A. Drew.

NEWCASTLE-UPON-TYNE. — Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Graduate and Student Section. "Mechanical and Electrical Plant as an Aid to the Civil Engineer," by W. J. Peacock.

Crown Hotel, Clayton Street West, 7.30 p.m. A.S.E.E. Tyneside Branch. "A Brief Survey of Metal Rectifiers and Their Applications in Industry," by J. Bulman.

PETERBOROUGH. — Peterborough Technical College, Eastfield Road, 7.30 p.m. Institution of Production Engineers, Peterborough Branch. "Need for Training of Technologists and Technicians," by C. Grad.

WEMBLEY PARK.—Century Hotel, Forty Avenue. A.S.E.E. North West London Branch. Annual branch dinner and dance.

Wednesday, 20th November

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 7 p.m. Institution of Production Engineers, Birmingham Branch. "Some Aspects of Technical Education in the U.S.A.", by T. B. Worth.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "Earthing of Low- and Medium-Voltage Distribution Systems and Equipment," by F. Mather.

I.E.E. London Student and Graduate Section, 2.30 p.m. Visit to B.T.H. Co., Willesden.

A.S.E.E. South East London Branch. Visit to the Central Electricity Authority Grid Control Centre.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institution, Corporation Road, 6.30 p.m. I.E.S. Tees-Side Group. Film show.

NOTTINGHAM. — E.M.E.B. Showroom Theatre, Smithy Row, 7.30 p.m. A.S.E.E. Nottingham Branch. "The Search for Underseas Coal Reserves," by W. H. Brooks.

RUGBY.—Rugby College of Technology and Arts, 6 p.m. I.E.E. Rugby Graduate and Student Section. "Electric Power Development in New Zealand," by J. Dykes.

SALISBURY.—Southern Electricity Board, 6.30 p.m. I.E.E. Southern Centre. "The Control of Nuclear Reactors," by R. J. Cox and J. Walker.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "D.C. Winder Drives using Mercury-Arc Rectifier/Invertors," by L. Abram, J. B. McBreen and J. Sherlock.

Physics Department, University of Sheffield, 5 p.m. Institute of Physics, Yorkshire Branch. "The Velocity of Light," by Dr. L. Essen.

Thursday, 21st November

BIRMINGHAM.—Birmingham Exchange and Engineering Centre, Stephenson Place, 6.30 p.m. Institute of Metals, Birmingham Local Section. "Metallurgical Thermodynamics," by J. N. Pratt.

BLACKBURN.—Golden Lion Hotel, 7.30 p.m. Incorporated Plant Engineers, Blackburn Branch. "The Heat Pump," by A. W. Bates.

CHELMSFORD. — Hoffmann's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Epoxy Resins and their Applications in Industry," by P. A. Dunn.

GLASGOW.—At the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, 7 p.m. British Institution of Radio Engineers, Scottish Section. "V.H.F. F.M. Transmission," by H. V. Sims.

INVERNESS.—I.E.E. North Scotland Sub-Centre District meeting. "Visit to Russia," by J. S. Pickles and R. J. Rennie.

IRELAND.—I.E.E. Irish Branch. "Changeover of the Dublin City Distribution Network from 5 kV to 10 kV," by O. MacDermott and J. McEvoy.

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "High-Voltage Experiments," opened by Prof. E. Bradshaw.

At the Royal Institute of British Architects, Portland Place, W.1, 6 p.m. Illuminating Engineering Society. "Modern Planning Trends in Office Buildings and Factories," by J. Bickerdike.

Caxton Hall, Westminster, 2.30 p.m. Diesel Engineers' and Users' Association. "Fuel Injection Equipment," by G. R. Green.

RUGBY.—Masonic Hall, 7.30 p.m. I.E.E. Rugby Sub-Centre. Dinner.

TONBRIDGE.—Rose and Crown Hotel, 7.30 p.m. A.S.E.E. Kent Branch. "The National Inspection Council" and "I.E.E. Wiring Regulations," by E. J. Sutton.

Friday, 22nd November

BIRKENHEAD.—Birkenhead Technical College, 7 p.m. British Institution of Radio Engineers, Merseyside Section. "Tropospheric Scatter System Evaluation," by M. Telford.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 7 p.m. Institution of Production Engineers, Wales Region. "Recent Developments in the Control of Dust," by W. B. Lawrie.

LONDON.—Savoy Place, W.C.2, 2.30 to 4.30 p.m. and from 5.30 p.m. I.E.E. Radio and Telecommunication Section. Discussion on "Radio Observations on the Russian Satellite."

Connaught Rooms, W.C.2, 5.30 for 6 p.m. Electrical Power Engineers' Association. Annual dinner and dance.

Pepys House, 14, Rochester Row, Westminster, S.W.1. Junior Institution of Engineers. "The Blowing of Blast Furnaces," by W. K. V. Gale.

SHRIVENHAM.—Royal Military College of Science, 7 p.m. Institute of Physics, South Western Branch. "The Field Emission of Electrons," by Professor F. A. Vick.

STOKE.—Grand Hotel, Hanley, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. Film show: "Cables Round The World."

STONE.—Crown Hotel, 8.30 p.m. I.E.E. North Staffordshire Sub-Centre. Annual dance.

Saturday, 23rd November

MANCHESTER.—Belle Vue, 6 p.m. A.S.E.E. Manchester Branch. Ladies' evening.

Birmingham Switchgear Exhibition

J. A. Crabtree & Co., Ltd., are holding an exhibition of their products at the Birmingham Exchange and Engineering Centre, Stephenson Place, Birmingham, 2, from Monday to Friday next week. They will be exhibiting particularly their type B.15 and B.26 air break contactor gear, and type D.6 manual starters, together with auxiliary equipment and limit switches. Various control panels and equipment will also be displayed incorporating this gear. Applications for tickets should be addressed to the company at Lincoln Works, Walsall, Staffs.

NEW PATENTS Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 20th November from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1953

18140. Sangamo Weston, Ltd.—Automatic electric control detection or measuring systems and instruments for use therein. 2nd June, 1954. (Addition to 700643.) (786481.)

24526. M-O Valve Co., Ltd., and Windsor, L. R. E.—Thermionic valves. 23rd August, 1954. (786632.)

1954

6750. Schwarzer, H. H. G. F.—A.c. power pack. 8th March, 1954. (786421.)

7630. Lucy & Co., Ltd., W.—Power operated mechanisms for electric switch operation. 11th March, 1955. (786559.)

12974. British Thomson-Houston Co., Ltd.—Permanent magnet excited generators. 4th May, 1955. (786485.)

14215. Marconi's Wireless Telegraph Co., Ltd.—Automatic tuning control arrangements. 22nd April, 1955. (786560.)

17452. Soc. Générale d'Electronique.—Projection of televised images. 14th June, 1954. (786553.) 19516. Projection of televised images in colour. 2nd July, 1954. (786554.)

19518. National Research Development Corporation.—Electrical control systems. 23rd June, 1955. (786489.)

26076. Linolite, Ltd.—Electric lampholders. 12th July, 1955. (786495.)

26769. Muirhead & Co., Ltd.—Electrolytic recording media. 17th June, 1955. (786496.)

29628. Philips Electrical Industries, Ltd.—Circuit arrangements for producing control voltage pulses. 14th October, 1954. (786498.)

30237. Etablissements M.C.B. & Veritable Alter, and Raymond, F. H.—Potentiometers. 20th October, 1954. (786566.)

30400. Philips Electrical Industries, Ltd.—Vacuum vessel such as a cathode-ray tube or a large rectifying tube having a metal wall which is made at least partly from thin sheet metal. 21st October, 1954. (786640.)

33155. Cinema-Television, Ltd.—Electric signal generators. 16th November, 1955. (786643.) 33156. Deflection arrangements for cathode-ray tubes. 16th November, 1955. (786501.)

35361. Marconi's Wireless Telegraph Co., Ltd.—Variable frequency oscillation generators. 15th August, 1955. (786569.)

36662. Ferranti, Ltd.—Microwave transmission devices. 14th December, 1955. (786545.)

1955

267. Ferranti, Ltd.—Electrical protective systems. 10th February, 1956. (786508.)

811. Light & Power Accessories Co., Ltd., and Lott, F. J.—Electrical switch boxes. 11th January, 1956. (786509.)

4150. Mullard Radio Valve Co., Ltd.—Electric trigger circuit arrangements and the like. 16th March, 1956. (786572.)

4900. Light & Power Accessories Co., Ltd., and Lott, F. J.—Cable grip or gland for electrical fittings. 17th February, 1956. (786649.)

5346. British Oxygen Co., Ltd.—Electric arc welding. 22nd February, 1956. (786650.)

7569. Thorn Electrical Industries, Ltd.—Electric lampholders for trans-illuminated panels. 3rd February, 1956. (786576.)

8010. Campbell, G. J.—Electric heating and air circulating units. 18th March, 1955. (786577.)

9959. British Thomson-Houston Co., Ltd.—Contact making brushes suitable for high altitude electrical equipment. 28th March, 1956. (786656.)

10058. International Business Machines Corporation.—Electrostatic methods of storing and recovering information. 6th April, 1955. (786520.)

10898. Marconi's Wireless Telegraph Co., Ltd.—Variable magnetic coupling devices. 16th December, 1955. (786578.)

11223. Stuttard, D. E.—Electric ignition appliance for liquid fuel burners. 12th March, 1956. (786440.)

12276. Rem-Cru Titanium, Inc.—Consumable electrodes for arc melting chemically reactive metals. 28th April, 1955. (786525.)

12724. Decca Record Co., Ltd.—Radar systems. 30th April, 1956. (786661.)

13954. Vereinigte Aluminium-Werke Akt.-Ges.—Continuous anode for use in producing aluminium by fusion electrolysis. 13th May, 1955. (786379.)

16239. Plumettaz Soc. Anon.—Circulation pump driven by an electric motor. 6th June, 1955. (786447.)

16306. Light & Power Accessories Co., Ltd.—Cable grip or gland for armoured cables. 24th April, 1956. (786666.)

20673. Libbey-Owens-Ford Glass Co.—Electrically conducting transparent article and method of making same. 18th July, 1955. (786586.)

21927. Sperry Rand Corporation.—Apparatus for dissipating microwave energy. 29th July, 1955. (786537.)

22406. Westinghouse Electric International Co.—Magnetic amplifier apparatus. 4th August, 1955. (786385.)

27898. Standard Telephones & Cables, Ltd.—Means and method of supporting the helix in travelling wave tubes. 30th September, 1955. (786453.)

28103. Tateishi, A. K.—Electric fans of the blower type. 3rd October, 1955. (786454.)

28195. Standard Telephones & Cables, Ltd.—Frequency-shift telegraph transmitters. 4th October, 1955. (786589.)

28245. Western Electric Co., Inc.—Electric circuits for analysing and synthesising periodic complex waves. 4th October, 1955. (786682.)

28394. Kober, W.—Permanent magnet field generator. 5th October, 1955. (786541.)

31478. Busch-Jaeger Dürener Metallwerke Akt.-Ges.—Electric time switching device. 3rd November, 1955. (786461.)

32192. Sperry Rand Corporation.—Magnetic amplifiers. 10th November, 1955. (786462.)

34574. General Electric Co.—Clothes drying machines. 2nd December, 1955. (786389.)

35405. Westinghouse Electric International Co.—Electric protective devices particularly for use with series capacitors. 9th December, 1955. (786391.)

37370. General Electric Co.—Electric circuit-breaker. 30th December, 1955. (786468.)

37419. Standard Telephones & Cables, Ltd.—Intelligence storage equipment. 30th December, 1955. (786469.)

37483. Siemens & Halske Akt.-Ges.—Modulators. 30th December, 1955. (786599.)

1956

830. Oak Mfg. Co.—Rotary switch type tuners. 10th January, 1956. (786600.)

2713. Akt.-Ges. Brown, Boveri & Cie.—Gas for instance air blast electric circuit-breaker. 27th January, 1956. (786607.)

3467. Standard Telephones & Cables, Ltd.—Electricity supply systems. 3rd February, 1956. (786699.)

5707. United-Carr Fastener Corporation.—Push-button electrical switches. 23rd February, 1956. (786404.)

8081. Standard Telephones & Cables, Ltd.—Push-pull amplifiers. 15th March, 1956. (786706.)

8113. Westinghouse Electric International Co.—Control systems embodying decoupling link apparatus. 15th March, 1956. (786615.)

8366. Cinch Manufacturing Corporation.—Holder for a thermionic valve electrical plug or other device having projecting terminal prongs. 16th March, 1956. (786617.)

8649. Westinghouse Electric International Co.—Cores for inductive apparatus. 20th March, 1956. (786707.)

10089. Luscher, P.—Apparatus for the electric heating-up of food warming plates. 3rd April, 1956. (786710.)

12796. Standard Telephones & Cables, Ltd.—Interconnection of circuit components and terminals. 26th April, 1956. (Addition to 753605.) (786624.)

15562. Fernseh Ges.—Supply arrangements for electric motors. 18th May, 1956. (Addition to 771872.) (786716.)

15639. Siemens-Schuckertwerke Akt.-Ges.—Apparatus for maintaining constant the voltage of synchronous machines. 18th May, 1956. (786717.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 23rd November:—

HOTPOINT TWIN-SPIN. No. 767,635. HOTPOINT SPIN-TWIN. No. 767,636. Class 7. Washing machines. HOTPOINT HI-SPEED. No. B765,219. Class 11. Electric heating installations and apparatus; and domestic electric appliances.—Hotpoint Electric Appliance Co., Ltd., Crown House, Aldwych, W.C.2.

PHONNEX. No. 765,223. Class 9. Electrical apparatus and instruments, radio apparatus and instruments, signaliing apparatus, and parts.—Peelo, Ltd., 116, Windmill Street, Gravesend, Kent.

CORALITE. No. 766,981. Class 9. Electrical apparatus.—Cumberland Engineering Co., Ltd., 108-114, Derby Road, Bootle.

MR. AUTOMATION (design). No. 767,253. Class 9. Electrical apparatus for measuring variable quantities, for indicating and recording such measurements and for controlling the operation of other apparatus.—Fielden Electronics, Ltd., Paston Road, Wythenshawe, Manchester.

BLANKETSTAT. No. 767,254. Class 9. Electric switches, thermostats, circuit-breakers and devices for automatically making and breaking electric circuits. No. 767,257 (design). Class 9. Scientific and electrical apparatus and instruments, and parts.—Otter Controls, Ltd., Otter 'Ole, Market Street, Buxton.

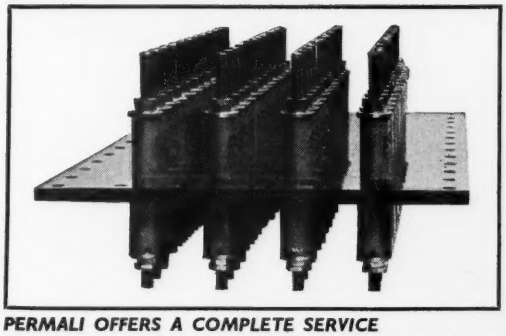
MAPELINE. No. 767,815. Class 9. Electric cables.—Metal and Pipeline Endurance, Ltd., 22, Queen Anne's Gate, London, S.W.1.

TEXON. No. 768,289. Class 9. Separators for electric accumulators.—Bibby & Baron, Ltd., New Bridge Mills, Dumers Lane, Bury, Lancs.

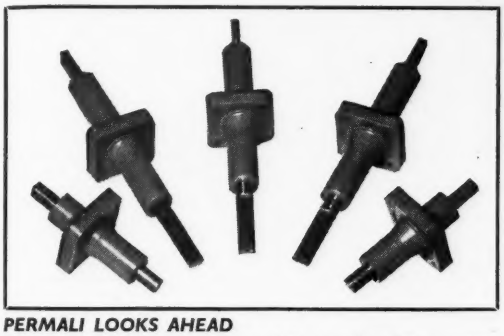
LECTROMELT. No. B753,343. Class 11. Electric furnaces (other than experimental furnaces), and parts.—McGraw Electric Co., Chicago, U.S.A. Address for service, c/o Heron Rogers & Co., Bridge House, 181, Queen Victoria Street, London, E.C.4.

LUKON (design). No. 758,199. Class 11. Heating apparatus and cooking apparatus, all being electric; and electric heating elements.—Lukon, Fabrik für Elektrothermische Apparate und Elektrische Stabheizkörper, Tauffelen, Switzerland. Address for service, c/o Reginald W. Barker & Co., 13, Charterhouse Square, London, E.C.1.

VISCOUNT. No. 764,917. Class 11. Cooking stoves and ranges.—Tricity Cookers, Ltd., 109, Kingsway, London, W.C.2.



PERMALI OFFERS A COMPLETE SERVICE
Permali produce the complete job from raw material to finished article—This EHT transformer terminal board, made from a Permali base with Dialam through-bushings, is one of many different components designed, manufactured, machined, assembled and tested entirely by Permali Ltd.



PERMALI LOOKS AHEAD
These cast-resin insulators, now being produced in quantity, constitute another new advance in manufacturing technique —made possible by constant research and development in the Permali laboratories.

PERMALI CATERS FOR SPECIAL OPERATING CONDITIONS
Made from Grade TH material, this bus barrier board is specially moisture resisting for tropical and high humidity applications.

PERMALI ENCOURAGES SKILFUL DESIGN
Combining Dialam S.R.B. fabric and paper tubes together with Permali throat plates and studs, these 33 kV arc control devices employ Permali manufactured materials to their best advantage.

PERMALI OFFERS NEW POSSIBILITIES
New design opportunities are opened up with Permaglass glass-fibre reinforced laminates. This welding transformer cover is typical of the many products for which this unique material is suited.

PERMALI FOR PRECISION
This 132 kV arc-control device demonstrates the machineability and strength of Permali. Note how simply metal fittings can be combined with the material.

When you need INSULATION . . . use the PERMALI *COMPLETE SERVICE*

for the design and development of components in:—

PERMALI —the insulating material outstanding for strength
PERMAGLASS —Glass fibre reinforced plastics
PERMAFLON —the P.T.F.E. plastic material with a unique combination of properties.
DIALAM —S.R.B. Paper and Fabric tubes.

Grades EH and TH Permali are MoS, Admirality, G.P.O., K.E.M.A. approved, fully meet BS 2572 and Def 5,000.

KEEP ABREAST OF NEW DEVELOPMENTS *and write for the latest technical data—or send us your print for quotation.*

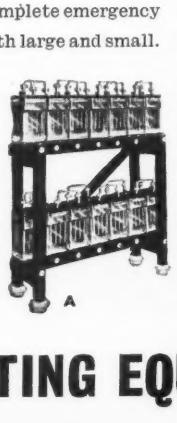
PERMALI LIMITED

Bristol Road · Gloucester · England · Telephone 24941

Ready for the call

Tudor ' Safetylyte ' is always ready to play the leading part. If a mains interruption occurs, it springs automatically into action for instant take-over at split-second notice. The Tudor storage battery included can be kept fully charged for many years at negligible cost and needs little maintenance. Tudor 'Safetylyte' Emergency Lighting Equipment is available in compliance with all Home Office and County Council regulations. It offers complete emergency lighting protection in every type of public building both large and small.

Please send for Publications Nos. 90, 91 and 92, which give full details of the standard range of 'Safetylyte' Equipment. *Comprehensive specifications for special emergency lighting installations prepared without obligation.*



A

B

A *Double-tier stand holding a typical battery of 14 Tudor sealed-type cells as used with 'Safetylyte' emergency lighting equipment.*

B *'Safetylyte' Major charging and control cubicle.*

T.169

TUDOR SAFETYLYTE EMERGENCY LIGHTING EQUIPMENT

THE TUDOR ACCUMULATOR COMPANY LTD., 137 VICTORIA STREET, LONDON SW1. Tel: TATe Gallery 0307 Works: DUKINFIELD, CHESHIRE. Tel: Ashton-under-Lyne 1651

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Aberdeen.—Corporation Lighting Department. 9th December. Electric lamps for the year 1958. (See this issue.)

Birmingham.—Public Works Committee. 4th December. Maintenance work on lifts in public buildings and schools. Sir Herbert J. Manzoni, city engineer, Civic Centre.

Bradford.—City Council. 11th December. Three electrically driven pumping units, control gear and electrical wiring. Sewage works engineer, Esholt Hall, near Shipley, Yorks.

Burma.—Burma Purchase Board, Rangoon. 21st November. 108 12 V batteries. (E.S.B. 26614/57. Ten/29020.)*

Canada.—Manitoba Hydro-Electric Board. 2nd December. Ash and dust handling plant for a new power station. (E.S.B. 26802/57. Ten/29121.)*

Ceylon.—Department of Government Electrical Undertakings, Colombo. Companies wishing to tender for the installation of alternators, boiler plant and other equipment for stage IIB of Ceylon's hydro-electric scheme should apply to the Department by 27th December. (E.S.B. 26695/57. Ten/29034.)*

Transport Board, Colombo. 20th November. Six portable and ten pedestal type electric grinders. (E.S.B. 26575/57. Ten/29022.)*

Chelmsford.—Borough Council. 26th November. Two electrically operated centrifugal pumps and a standby diesel engine driven generator, together with ancillary equipment, at Witford Hall industrial estate. Borough engineer, Duke Street Offices.

Chile.—Dirección del Litoral y de Marine Mercante, Valparaiso. 25th November. Telecommunications and electrical equipment for the Chilean Navy. (E.S.B. 25973/57. Ten/28951.)*

Croydon.—Corporation. 27th November. Electrical work in pre-war Council houses. (See this issue.)

Durham.—County Council. Electrical installation at a new fire station at Consett. County architect, South Street, Durham.

Fareham.—U.D.C. 9th December. Trunk road lighting equipment. (See this issue.)

Formosa.—Central Trust of China, Taipei. 3rd December. Four 120 h.p. motors and mining cable. 4th December. Two 75 h.p. motors. 6th December. Twelve 25 kVA transformers. 9th December. Mining cable, centrifugal fan and one diesel mine locomotive. (E.S.B. 26652/57.I.C.A. Ten/29008.)* 7th December. Telephone switchboard, 15 automatic telephone sets, selenium rectifier, storage battery, etc. (E.S.B. 26665/57.I.C.A. Ten/28994.)*

Heston and Isleworth.—Corporation. 11th December. Street lighting equipment. (See this issue.)

Iraq.—Central Foreign Purchasing Board. 27th November. Electric lift. (E.S.B. 26701/57. Ten/29042.)* 150 electric refrigerators. (E.S.B. 26702/57. Ten/29055.)* Portable X-ray apparatus. (E.S.B. 26700/57. Ten/29054.)*

Leeds.—City Waterworks Department. 6th January. Electric floor heating system. (See this issue.)

London.—India Store Department. Railway electrical and power signalling equipment. (See this issue.)

New Zealand.—G.P.O., Wellington. 11th December. 48 portable electric drills. (E.S.B. 26741/57. Ten/29045.)* 12th December. Telephone cable. (E.S.B. 26463/57. Ten/28963.)*

Reading.—Corporation. 6th December. Electrical installations in 308 houses. (See this issue.)

Rhodesia and Nyasaland.—Federal Tender Board, Causeway, Salisbury. 22nd November. X-ray machine for Fort Victoria Hospital. 29th November. X-ray plant, etc., for Llewellin Hospital, Kitwe. (E.S.B. 26543 and 26546/57. Ten/29061-62.)* 22nd November. Six electric steam jet cleaning machines. (E.S.B. 26548/57. Ten/29060.)*

South Africa.—Union Tender and Supplies Board, Pretoria. 21st November. Magnetic tape recording system for airfield control tower. (E.S.B. 26425/57. Ten/28970.)*

Stores Department, South African Railways, Johannesburg. 29th November. Main motor armature coils. (E.S.B. 25897/57. Ten/28906.)* 6th December. Forty-one or alternatively forty-five, 110 V d.c. motor generator sets. (E.S.B. 26912/57. Ten/29079.)*

Sudan.—Sudan Gezira Board. 23rd November. 600 electric light poles. (E.S.B. 26595/57. Ten/29086.)*

Turkey.—Allied Land Forces, South Eastern Europe, Izmir. 29th November. Signal generator. (E.S.B. 26776/57. Ten/29047.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Enfield.—Works Committee. Street lighting in Great Cambridge Road (£1,653).—Concrete Utilities.

Lancashire.—Education Committee. Renewal of defective electrical installation at Lancaster Dallas Road County and Secondary School (£3,046).—Nicholson & Martin.

London.—L.C.C. Accepted. Electrical installations at the Tetley Street site, Poplar (£6,000).—Electric Contracts (London), Ltd. Installation of electric hot water systems in 61 dwellings at Becontree estate, Essex (£3,586).—M. E. Bailey & Co., Ltd. Renewal and improvement of electrical installation at Haberdashers' Aske's Hatcham (Girls') School, Deptford (£5,142).—Buchanan & Curwen, Ltd. Supply and installation of electric hot water systems in 170 dwellings at the Watling estate, Hendon (£10,777) and in 114 dwellings at Downham estate, Lewisham (£6,986).—F. J. Baynes & Co., Ltd. Renewal and improvement of electrical installations at Hackney Technical College (£13,000).—Powerlite Electrical Installations, Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aldershot. — Methodist church, Stone Street; Philip G. Idle, architect, 41, Grosvenor Road.

Barrow-in-Furness.—Mineral water and bottling factory; Thomsons, Ltd., aerated water manufacturers, Albert Street.

Bedford.—Six-storey block of flats in Beauchamp Row, with electrical underfloor heating, radiators and drying cabinets (£92,757); Warton & Goodship, Ltd., Bedford.

Bentley (Yorks).—Community centres at The Homestead, Amersall Road, Petersgate and Stonehill Rise; U.D.C. architect.

Birkenhead.—Showrooms and offices, Hamilton Street; W. Watson & Co. (Liverpool), Ltd., 35, Bold Street, Liverpool.

Bishop's Stortford.—Houses (52) for U.D.C.; G. N. Drinkwater, clerk, The Causeway Offices.

Blandford Forum.—Houses (50), Salisbury Road; town clerk, 2, The Plocks, Blandford Forum, Dorset.

Boston.—Houses (98), Woad Farm site, and bungalows (32), Church Road/Freiston Road site; town clerk, Municipal Buildings, Boston, Lincs.

Brighton.—One eleven-storey and two two-storey blocks of flats on the Coldean Lane/Lewes Road site; D. J. Howe, borough engineer, 26/30, King's Road.

Bury. — Grammar - technical school; Bradshaw, Gass & Hope, architects, 19, Silverwell Street, Bolton.

Chatham.—Houses (40), Vale Drive/Concord Avenue site; Davis Estates, Ltd., developers, 346-350, Kilburn High Road, London, N.W.6.

Cheltenham.—Hotel, Leckhampton; L. W. Barnard & Partners, architects, 13, Imperial Square.

Darlington.—Additions to Aycliffe sewage disposal works for R.D.C. (£100,000); J. D. Collins, surveyor, 51, Coniscliffe Road.

Houses (164), Low Coniscliffe; Kingswood Hill Co., Darlington.

Dorchester.—County constabulary headquarters (£58,030); county architect, County Hall, Dorchester.

Dundee.—Houses (386), City Road, and additional 400 houses on the Camperdown estate; R. Dron, city architect, 17, City Square.

Durham.—Grammar/technical school at Barnard Castle (£145,000); G. Stephenson, Ltd., contractors, Chester Street, Bishop Auckland.

Infants' school, Newton Aycliffe (£37,000); Middleton & Co., builders, Haughton-le-Skerne, near Darlington.

Social welfare centres for the National Coal Board at Blackhall (£39,000), Bowburn (£46,000), Brandon (£23,750), Murton (£78,000) and Heworth (£13,000); N.C.B. Architects' Department, 24, The Side, Newcastle-on-Tyne.

Offices at Elvet for Durham County Executive of the National Health Service (£50,000); Fennell & Baddiley, architects, Bridge End Chambers, Chester-le-Street.

East Suffolk.—Secondary modern schools at Stradbroke and Butley (£90,000 each); county architect, County Hall, Ipswich.

Edinburgh.—Primary school, Magdalene Gardens, Portobello (£120,000), and additions to R.C. secondary school, Chalmers Road (£110,000); A. Steele, city architect, City Chambers, High Street.

Edmonton.—Block of offices, canteen and garage at rear of 313-319, Fore Street; Fuller, Hall & Foulsham, architects, 212, High Holborn, London, W.C.1.

Esher.—Shops and offices, High Street; J. Seymour Harris & Partners, architects, Greenfield Crescent, Edgbaston, Birmingham.

Exeter.—Houses (153), Bacon Lane estate; city architect.

Faversham.—Houses (150), Davington Court estate; Heybridge Development & Construction Co., Ltd., 75, Heybridge Avenue, S.W.16.

Gloucester.—Houses (67), Frampton-on-Severn, Stage 1; Dancey and Meredith, architects to R.D.C., Bleak House, Station Road, Gloucester.

Gosport.—Offices; Hants & Dorset Motor Services, Ltd., High Street.

Gravesend.—Dwellings (132), North Cray Place estate; borough surveyor.

Hastings.—One-storey and three-storey buildings as extension to High School for Girls, The Ridge; borough engineer, 37, Wellington Square.

Hounslow.—Five-storey office block and 50 flats, Lampton Island site; Rodwell Properties, Ltd., 9, Hertford Street, London, W.1.

Laboratories; Parke Davis & Co., Staines Road.

Leeds.—Engineering faculty buildings for University; Lanchester & Lodge, architects, 10, Woburn Square, London, W.C.1.

Shopping centre in the Burmantofts area; R. A. H. Livett, city architect, Priestley House, Quarry Hill, Leeds, 9.

Leicester.—Improvements and extensions to Wyggeston Boys' School (£66,000); city architect.

London.—Dwellings (129), Teesdale Street estate, Bethnal Green; Howes & Jackman, architects, 1, Verulam Buildings, Gray's Inn, W.C.1.

Baptist chapel, Brunswick Road, Millwall; Spalding, Myers & Attenbrow, architects, 14, New Court, Carey Street, W.C.2.

Extensions to Stanley Technical Trades School, South Norwood; Riches & Blythin, architects, 16, Northumberland Avenue, W.C.2.

Works and offices, Lavington Street, Southwark; Trollope & Colls, Ltd., builders, 41/44, Great Queen Street, W.C.2.

Loughborough.—New handicraft workshops for Loughborough Training College (£64,000); county architect, 123, London Road, Leicester.

Luton.—Outpatients' department for Luton and Dunstable Hospital; Ross, Barker & Wallace, electrical consultants, 67, West Nile Street, Glasgow, C.2.

Manchester.—Factory, Leestone Road, Northenden; Ajello Pianos, Ltd., Harpur Road, Wythenshawe.

Middlesex.—Home for old people, Eastcote (£75,000); C. G. Stillman, county architect, 1, Queen Anne's Gate Buildings, London, S.W.1.

Morpeth.—Nursing and domestic staff accommodation at Northgate Hospital for Newcastle Hospital Board, Benfield Road, Newcastle-on-Tyne (£26,000); P. H. Knighton, Board's chief architect.

Newcastle-on-Tyne. — Factory, White Street, for R. Blackett Charlton & Co., Ltd., Manor Works, Newcastle; own architects.

Flats and maisonnettes (254) and ten shops in the Noble Street area (£434,000); G. M. Pearson and Son, Ltd., builders, Front Street, Hetton, Co. Durham.

Houses (300), Wharrier Street area; city architect, 18, Cloth Market.

Northfleet.—Dwellings (264), Rosherville estate; Wates Built Homes, Ltd., 1258, London Road, S.W.16.

Offices, Thames Works, Grove Road; Terry Structures, Ltd., Stonebridge Road.

Oxford.—Buildings for Department of Metallurgy, Keble Road; Professor Basil Ward, architect, 32, Wigmore Street, London, W.1.

Paisley.—Houses (168), George Street/Canal Street and Blackhall sites (Scheme A), and houses (168), at Foxbar (Scheme B); John A. McGregor, burgh engineer, 14, Gilmour Street.

Peterborough.—Combined scheme for infant welfare centre and occupation centre (£30,900); Granville Building Co., Ltd., Russell Street, Peterborough.

Plymouth.—Houses (68), Southway estate; city architect.

Portsmouth.—Houses (96), Parkhouse Farm estate; Howe & Bishop, Ltd., builders, Clarendon Street.

Rayleigh (Essex).—Houses (13), Cheapside; C. E. Fitzgerald, clerk to U.D.C., Hockley Road.

Redcar.—Houses (167), Green Lane estate; Needham, Thorp and White, architects, 5, High Petergate, York.

Richmond (Surrey).—Experimental department; Chrysler Motors, Ltd., Mortlake Road, Kew Gardens.

Rochdale.—Four-stage scheme for new technical college in Holland Street (£915,000); Yorks, Rosenberg and Mardall, architects, 2, Hyde Park Place, London, W.2.

Romford.—Dwellings (242), Harrow Crescent; Coward (Contractors), Ltd., 101, Lower Anchor Street, Chelmsford.

St. Albans.—Factory; Robot Agricultural Machinery Co., Ltd., Ashley Road.

Scarborough.—Technical college; Gollins, Melvin, Ward & Partners, architects, 15, Manchester Square, London, W.1.

Seaham.—Reconstruction of surface buildings at Seaham Colliery and Vane Tempest Colliery for N.C.B. (No. 2 area), Stockton Road, Sunderland.

Sheffield.—Radiotherapy centre, Whitham Road; Adams, Holden & Pearson, architects, 38, Gordon Square, London, W.C.1.

Smethwick.—Multi-storey flats, No. 2 redevelopment site (£1,082,300); R. Fletcher, borough engineer, Council House.

Southampton.—Showrooms, Above Bar; Jackson & Greenen, architects, Hinton Buildings, Hinton Road, Bournemouth.

South Moor (Co. Durham).—Reconstruction of the Tivoli Cinema for M.B.C. Cinemas, Ltd.; Gordon Durham & Co., contractors, Moor Lane, East Boldon.

South Shields.—Extensions to General Hospital; Regional architect, "Dunira," Osborne Road, Newcastle.

Street.—Concert hall, canteen, etc.; C. & J. Clark, Ltd., shoe manufacturers, Street, Som.

Swansea. — Dwellings (172), Brondeg estate; borough architect.

Warehouse, Gray's Terrace; Co-operative Wholesale Society, Ltd., St. Mary Street.

Tiverton.—Houses (100), on estates at King Street, Westexe South and Wilcombe; borough engineer, St. Andrew's Street.

Tunbridge Wells.—Houses (64), Sherwood estate extension; borough surveyor, Town Hall.

Uxbridge.—New buildings for Hillingdon Hospital; J. Stinton Jones & Partners, electrical consultants, 21, Gloucester Place, London, W.1.

Wakefield.—Alterations and extensions to Hatfield Hospital, Stanley; Shapley & Davison, architects, 3, Kingston Terrace, Leeds.

Wanstead.—Flats (26), Sultans Road; Tooley & Foster, architects, Midland Bank Chambers, Buckhurst Hill.

Warwick.—Thirteen-storey block of flats, Percy estate; borough engineer, 20, The Butts.

Wigan.—Extensions to Wigan and District Mining and Technical College (£407,308); county architect, County Offices, Preston.

Windsor.—Second stage of College of Further Education; W. E. Chivers & Sons, Ltd., builders, Devizes, Wilts.

Woking.—Works extensions for Unwin Bros., Ltd., printers; J. Jarvis & Sons, Ltd., builders, 239, Vauxhall Bridge Road, London, S.W.1.

Worthing.—Erection of Winter Garden on Pier entrance site (£39,800); E. G. Townsend, town clerk, Town Hall.

Dwellings (101), Cotswold Road and Half Moon Lane; Pondhigh Property Co., Ltd., 8, South Street, Lancing.

Wolverhampton.—Office block, Penn Road; Star Aluminium Co., Ltd., Marston Road.

Catalogues and Lists

AIR CONDITIONING.—Illustrated 28-page booklet giving particulars of the company's range of fans, air conditioning equipment and other products, together with catalogues of fans, renewable media air filters, dust filters and oil mist and fume collection equipment, etc.—**Air Control Installations, Ltd.,** Ruislip, Middlesex.

CONDUIT FITTINGS.—Brochure describing the "Streamline" ball socket cover. —**Kenwell Electric, Ltd.,** Spotland Bridge, Rochdale, Lancs.

CONVEYORS AND TRUCKS.—Catalogue (302) describing the "RolaVeyor" gravity conveyor and a leaflet (303) dealing with the Collis truck.—**J. Collis & Sons, Ltd.,** Regent Square, Gray's Inn Road, London, W.C.1.

DOMESTIC EQUIPMENT. — 29-page illustrated catalogue with price list giving details of the company's range of modern and traditional lighting fittings and heating appliances.—**G.B.M. (Electrical), Birmingham,** 439, Moseley Road, Birmingham, 12.

ELECTRIC BLANKETS.—Leaflet and price list giving particulars of the company's electric blankets, pads and other products.—**Milliwatt, Ltd.,** 44, Princess Road, Regent's Park, London, N.W.1.

ELECTRIC TOOLS.—Series of leaflets dealing with the range of "Home-Master" electric tools and attachments and a leaflet on the "Power-Pak" workshop.—**Selecta Power Tools, Ltd.,** 116, Victoria Road, Willesden, London, N.W.10.

FLOAT SWITCH. — Leaflet illustrating and describing the "HyFlo" float switch.—**A. Kingsley Williams,** Victory Works, Newbold Road, Chesterfield.

FURNACES.—Series of five booklets dealing with various types of electric furnaces produced by the company.—**Birlec, Ltd.,** Tyburn Road, Erdington, Birmingham, 24.

INSTRUMENTS.—Leaflets dealing with various instruments manufactured by the company including galvanometers, potentiometers and a stabilised a.c. mains unit for use with the "Unicam" SP 500 spectrophotometer.—**Doran Instrument Co., Ltd.,** Stroud, Gloucester.

LABELS.—Size chart, price list, samples and leaflet describing the "Tickotab" labels and dispensers suitable for marking, coding, pricing and sealing purposes on all dry surfaces.—**John Gosheron & Co., Ltd.,** 79-81, Albert Embankment, London, S.E.11.

LAMPS.—37-page price booklet (OS3945) covering the "Osram" range of lamps and fluorescent tubes.—**General Electric Co., Ltd.,** Magnet House, Kingsway, London, W.C.2.

LIGHTING FITTINGS.—Leaflet illustrating the "Spot-On" fluorescent fitting incorporating a gearless 4 ft 40 W lamp and a 75 W ballast spot-lamp in adjustable housing. —**H. W. Field & Son, Ltd.,** Harold Wood, Essex.

Illustrated leaflet on the "Popular Five/Eighty" fluorescent lighting fitting.—**Ascot Lamps & Lighting, Ltd.,** Arcola Street, London, E.8.

Illustrated brochure covering additions to the "Mondolite" range of lighting fittings.—**Troughton & Young (Lighting), Ltd.,** 143, Knightsbridge, London, S.W.1.

MEASURING INSTRUMENTS.—Four leaflets dealing with round and square moving-iron type switchboard instruments, a portable current density indicator and rotary synchroscopes.—**English Electric Co., Ltd.,** Stafford.

MEDICAL LAMPS.—Brochure giving particulars of the "Ergon" dual-purpose ultra-violet and infra-red lamp.—**Ergon Electrical Manufacturing Co., Ltd.,** Vencourt Place, King Street, London, W.6.

OVERHEAD LINE EQUIPMENT.—Brochure dealing with service taps and insulating shrouds.—**W. T. Henley's Telegraph Works Co., Ltd.,** 51-53, Hatton Garden, London, E.C.1.

RECTIFIERS.—23-page descriptive booklet dealing with Siemens & Halske contact cooled selenium rectifiers for radio and television equipment.—**R. H. Cole (Overseas), Ltd.,** 2, Caxton Street, Westminster, London, S.W.1.

Technical data sheet (F/SIL.101) dealing with three types of silicon junction low power rectifiers.—**Standard Telephones & Cables, Ltd.,** Edinburgh Way, Harlow, Essex.

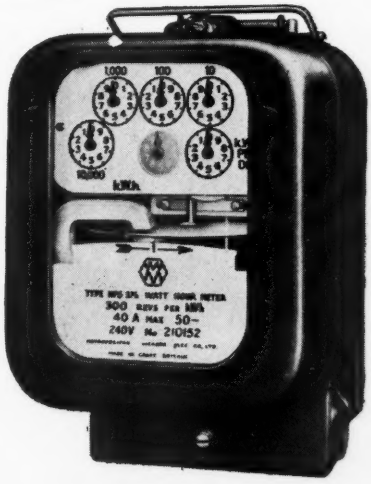
Count Seven . . .

and choose the

METROVICK

TYPE NF5 Watt-hour Meter

Exceeding the already high standards of meter performance today, the type NF5 watt-hour meter is the result of demand for even wider domestic load ranges. Built to give many years of sensitive and dependable service, its design incorporates the following seven important features :



- *High degree of accuracy over wide range of loads*
- *Complete temperature compensation*
- *Damping system giving complete stability*
- *Simple and accessible adjustments for calibration*
- *Resilient lower (jewel) bearing*
- *Easy dismantling for maintenance*
- *Available with six-figure cyclometer register*

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ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

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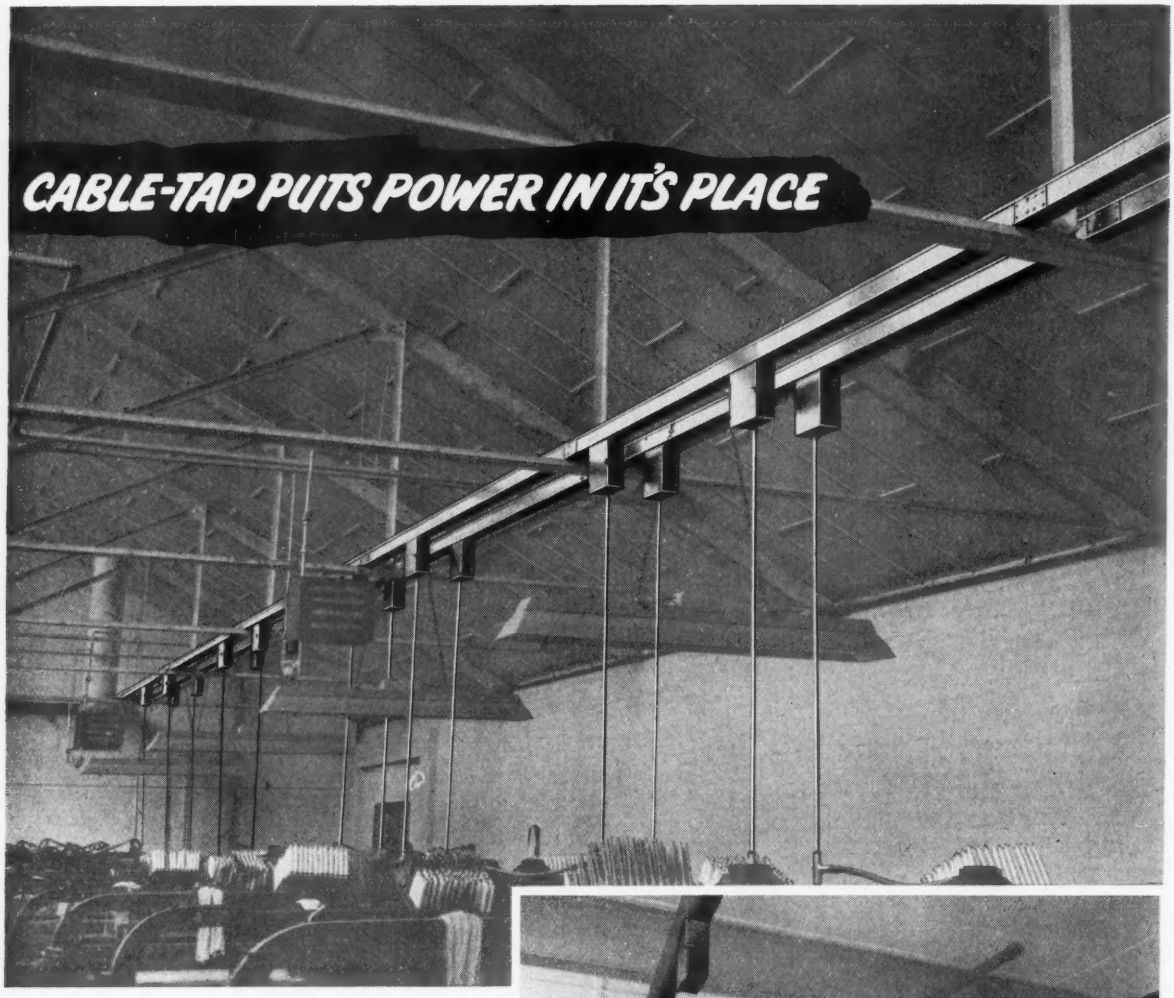
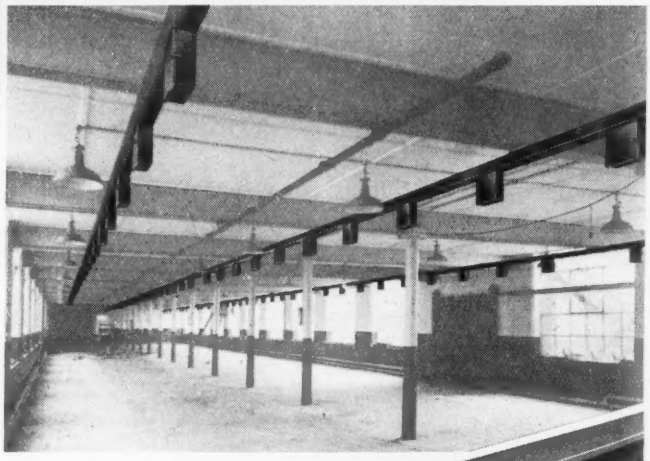


Cable Tap System, installed in a Textile Factory

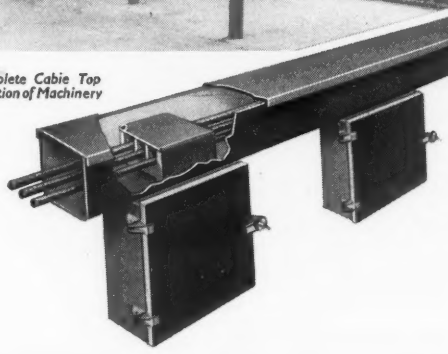
Cable-Tap is the ideal system for feeding rows of low-power machines. Where the total load does not exceed 100 amps. per phase, Cable-Tap offers all the advantages of Busbar system at greatly lowered cost.

Cables for lighting circuits may be carried in the same trunk, thus reducing still further the cost of installation.

Cable-Tap offers neatness, safety, simplicity and economy. Made by the Power Centre Company — manufacturers of industrial distributor gear for over a quarter of a century.



Photograph showing complete Cabie Top System prior to the Installation of Machinery



We also manufacture Busbar Chambers ; Switchboards ; Cable Trunking ; Cable Tap Systems ; Busbar Rising Mains ; Fuse Units ; Switchfuses ; Fuseboards and special electrical equipment.

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Grams : "Powercent, Wednesbury"

LONDON OFFICE : Wellington House, 125-130 Strand, W.C.2
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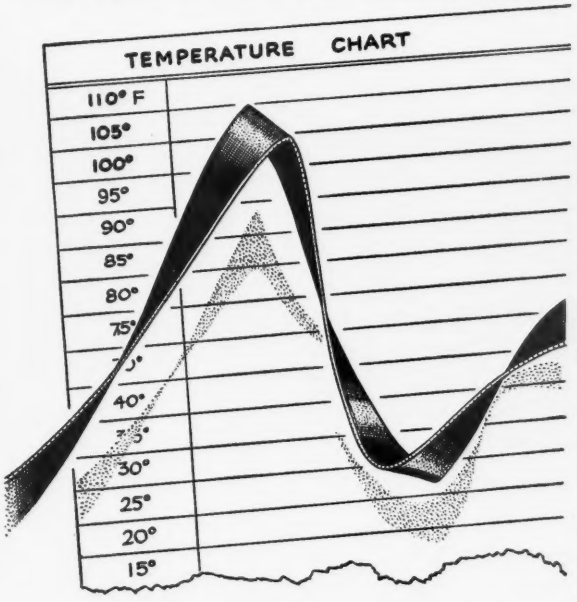

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In cable protection, P & B tape does vital work in power houses, transformer stations, telegraph and telephone installations. No element can pervade it, no chemical corrode it. P & B tape on test greatly exceeded the requirements of the British Standard for an adhesive insulating tape for electrical purposes.

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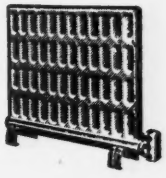

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Domestic Infra-red Heaters incorporating new features. Loading 750 watts.

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Convector Heaters — Skirting Board Styled — two sizes which can be built up in multiples.

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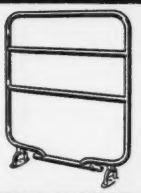

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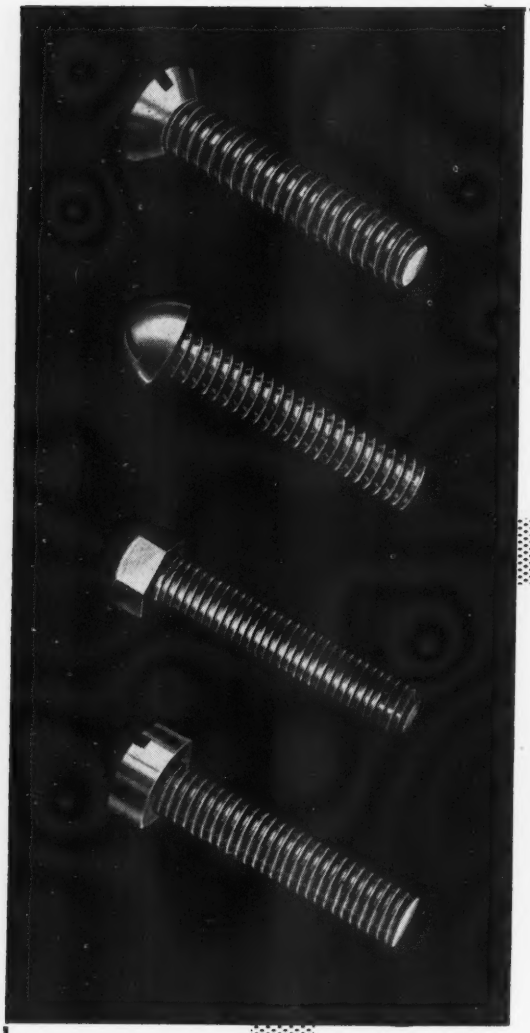

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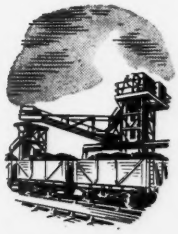

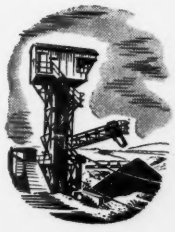

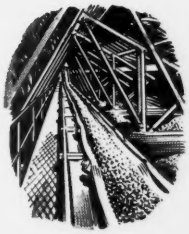

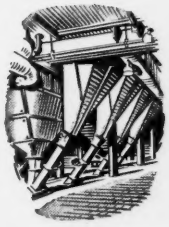

The range of IC material handling equipment is sufficiently comprehensive* to handle almost any loose material from its source to ultimate use or disposal. Progressive design and sound IC engineering mean more efficient handling all along the line.

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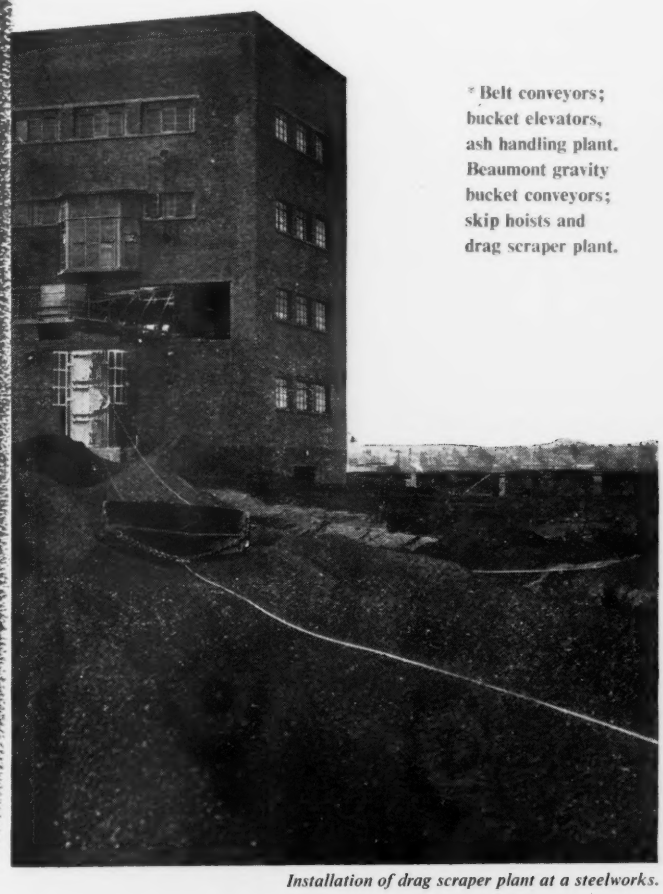

Installation of drag scraper plant at a steelworks.

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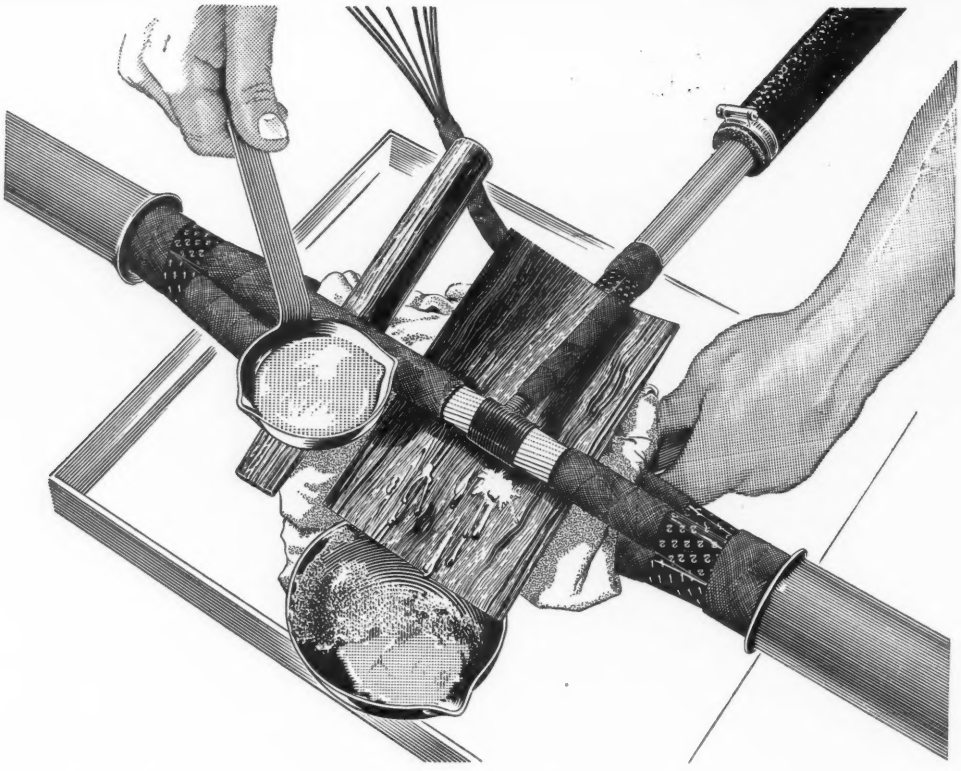

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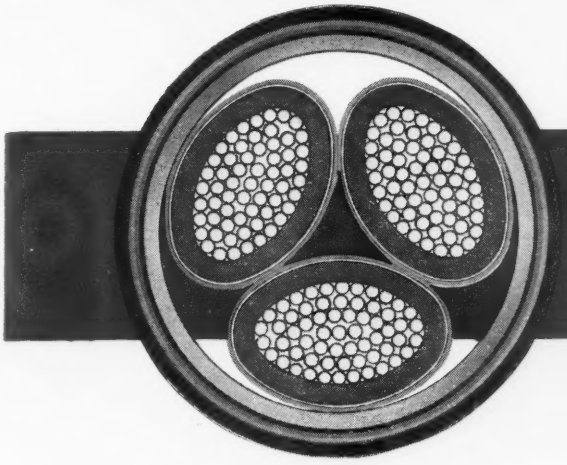

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Further information on D.S.O. Cables is contained in Publication No. 392 available on request.

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B.S.88:1952 requires tests to be taken to prove compliance with the following:—

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Clause 16:	Temperature Rise at current rating.
Clause 17:	Time Current Characteristics.
Clause 18:	Minimum Fusing Current.
Clauses 19–22:	Short Circuit Performance.

All 'ENGLISH ELECTRIC' H.R.C. Fuse-Links to B.S.88:1952 listed in our Price List FG/127B have been fully tested to Clauses 15–22 inclusive proving compliance in all respects with B.S.88:1952 and Certificates of Short Circuit Rating have been issued by the Association of Short Circuit Testing Authorities.

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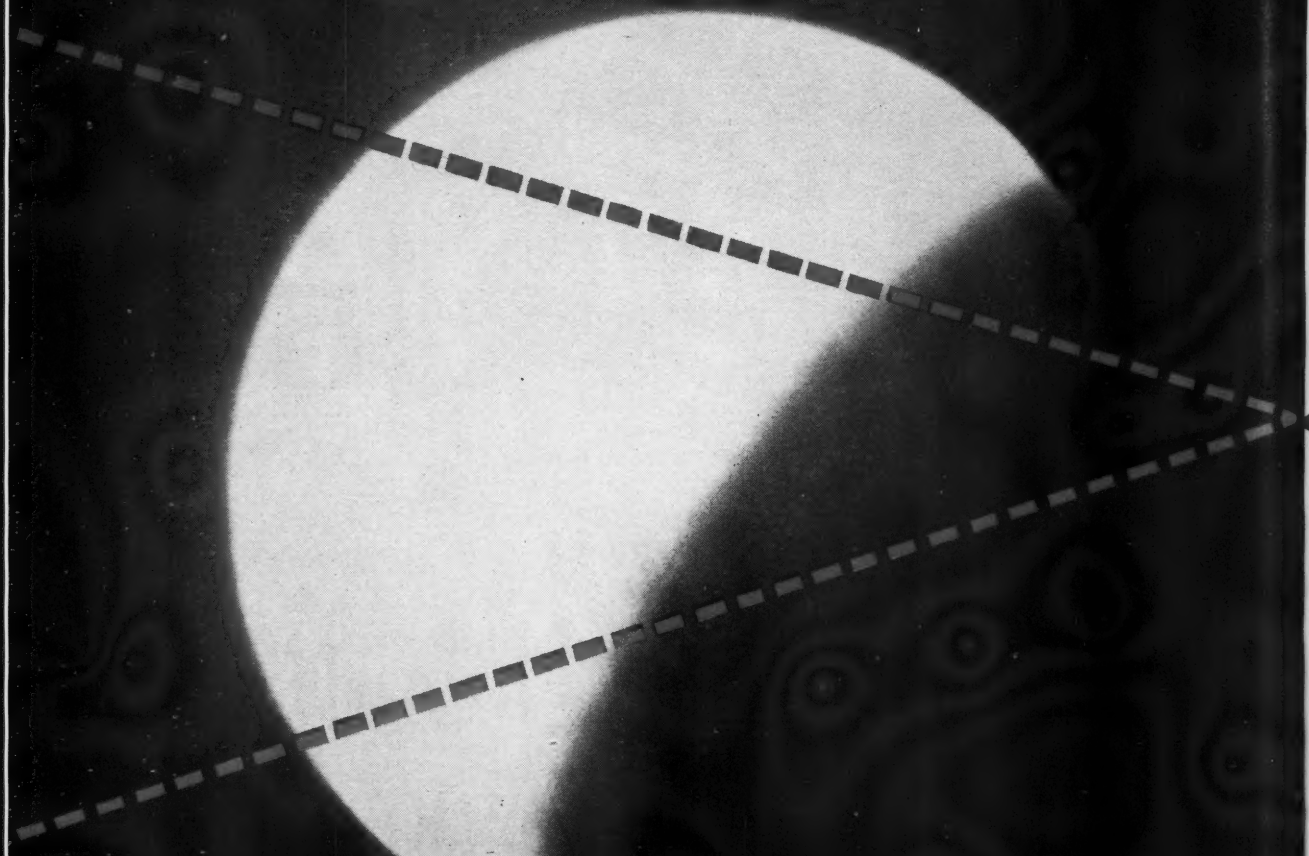

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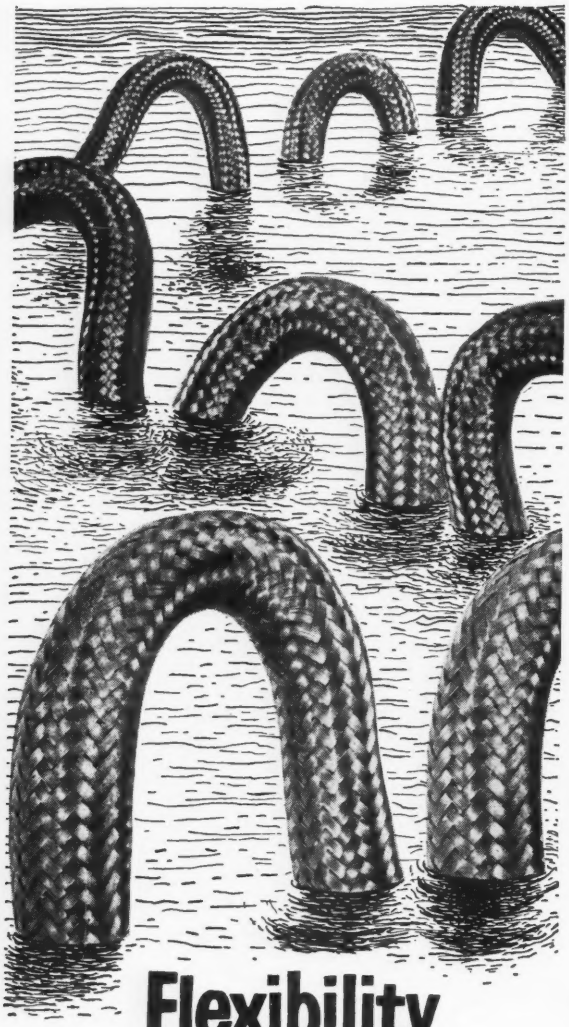

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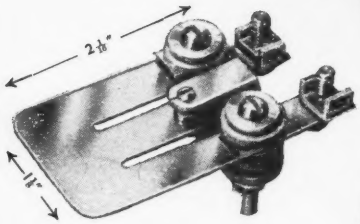

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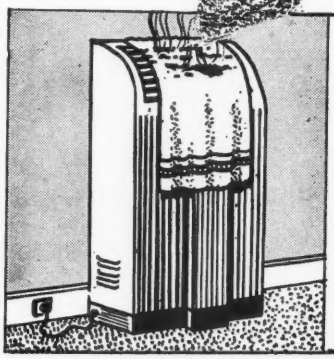

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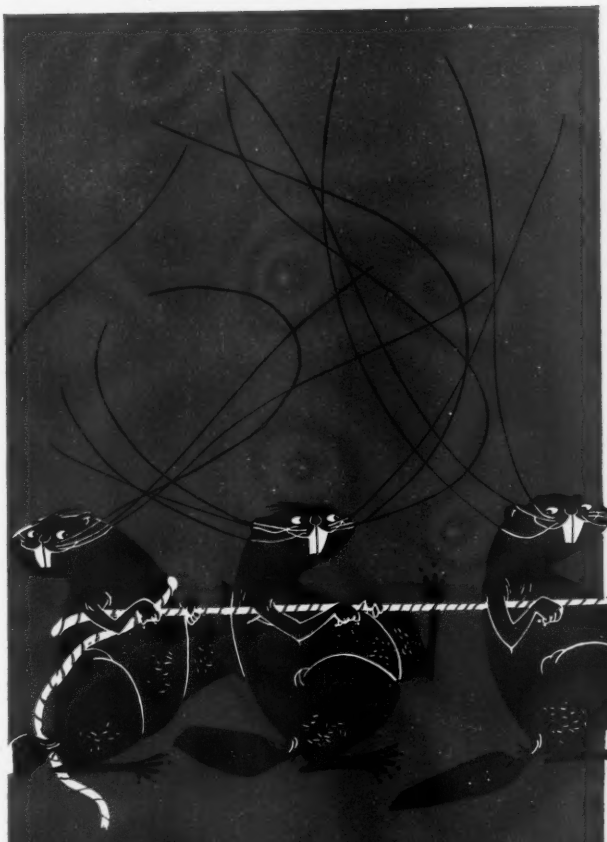

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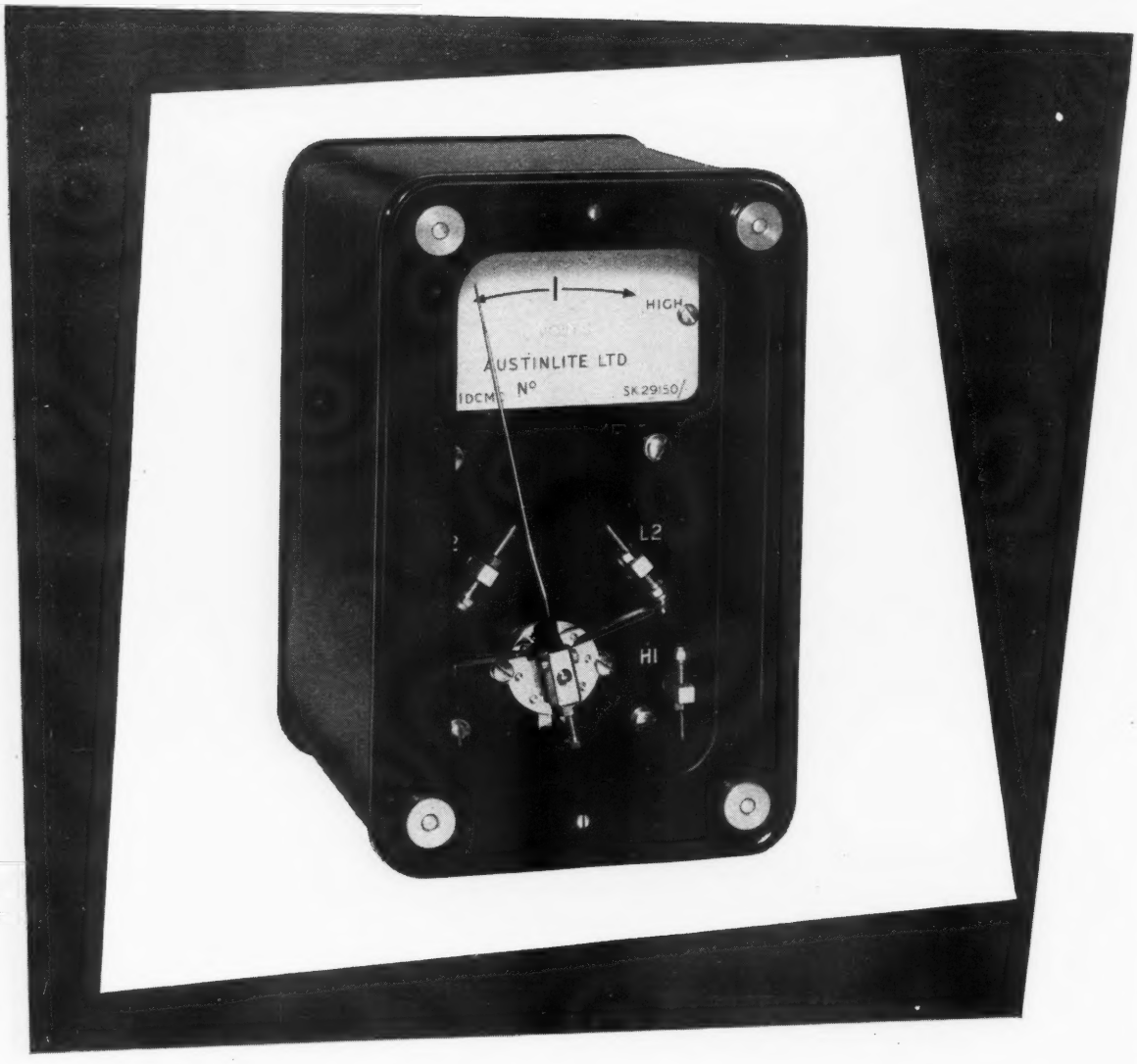

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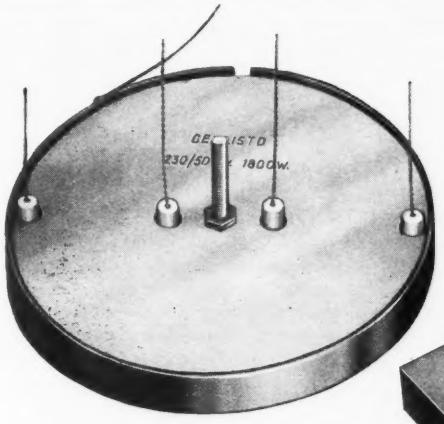

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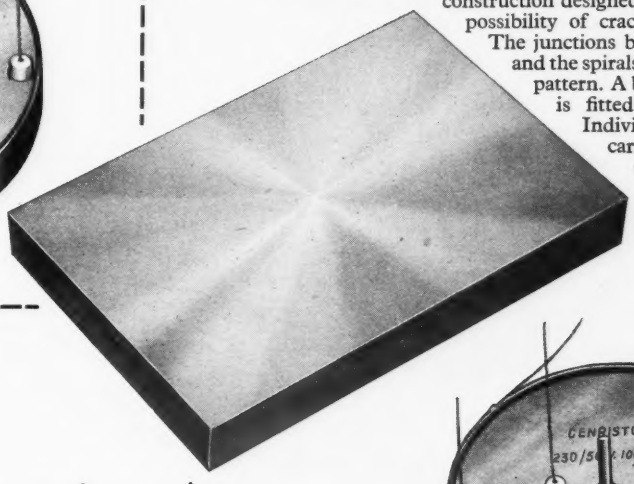

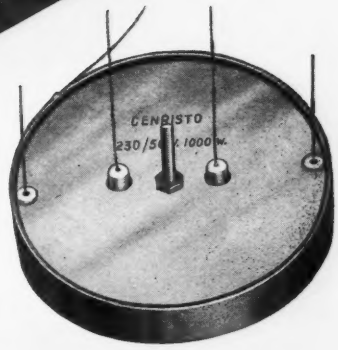

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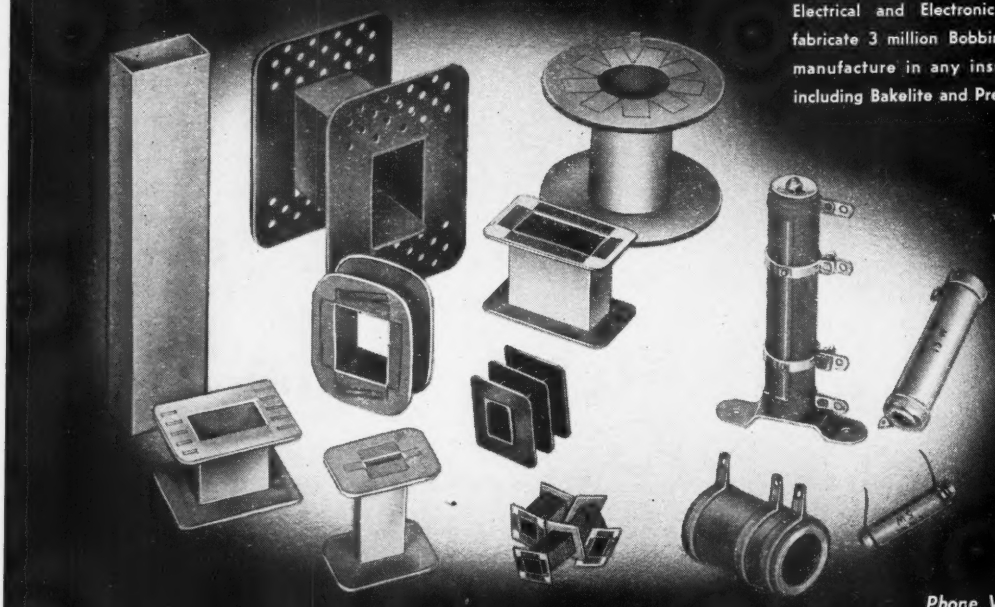

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A MUST *for jointing cables successfully, particularly P.V.C. No wiping required on V.I.R. L.C.S.W.A.S. Cables.* **JUST OUT** *Nylon or Polythene Coated Glands for corrosive conditions . . . . .*

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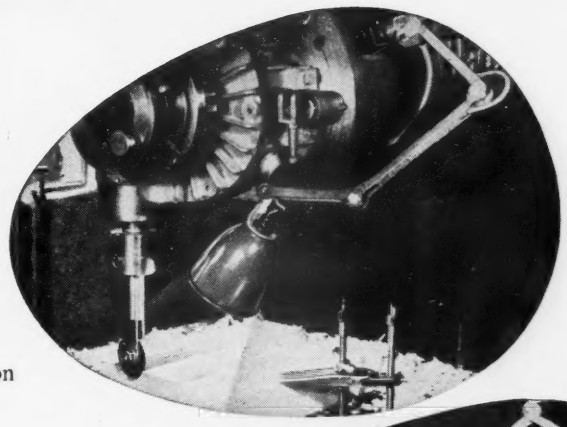
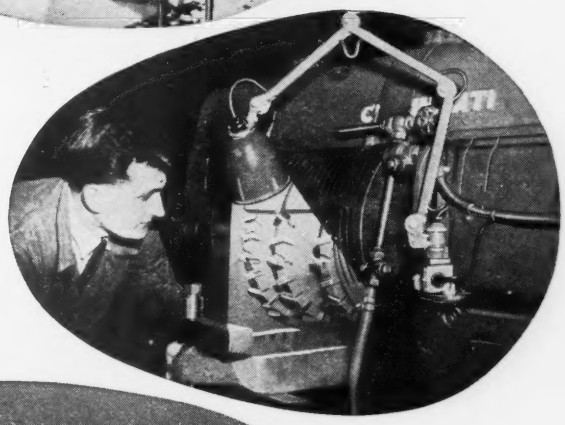
looked at in *THIS* light...

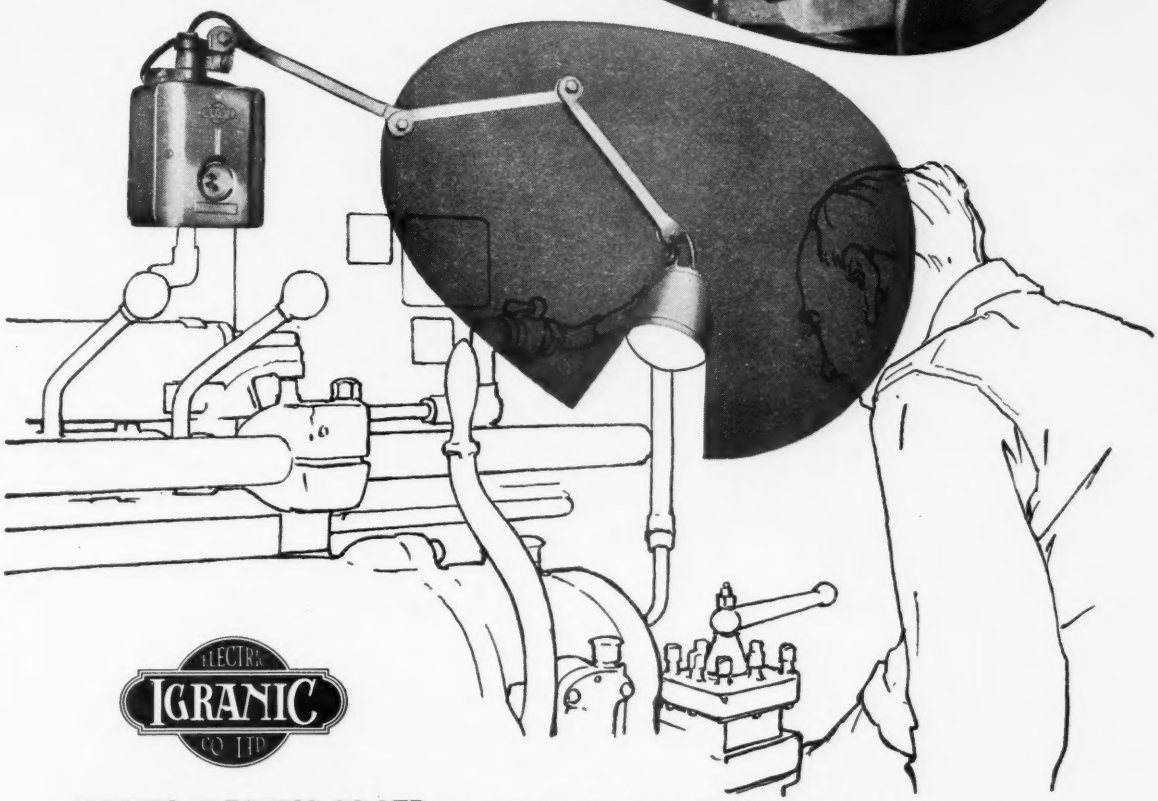


it is easy to see there is light where you want it, when you want it, with full definition at the working point. Add, too, the SAFETY of low voltage and you have some of the reasons why industry generally prefers



Lō-Vō-Lite

LOW VOLTAGE SAFETY LIGHTING



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SLIM OPEN ENDED TROUGH
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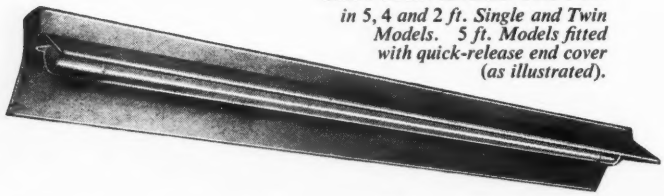
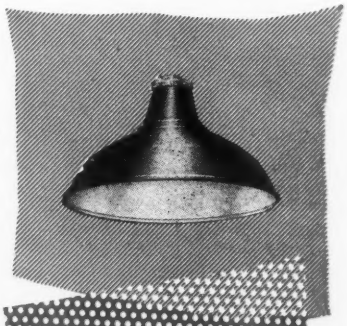
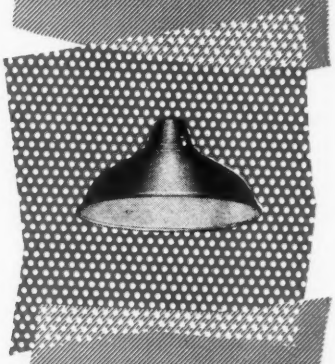


SLIM BATTEN FITTING
Specification as above but without reflector.

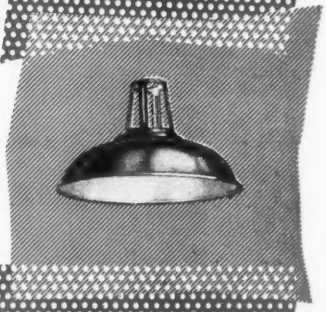
Weatherproof Dispersive Type



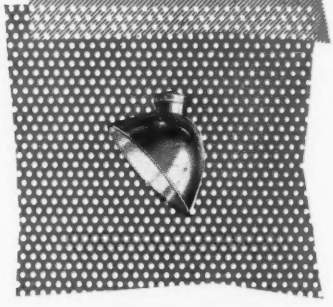
1¼" Hole Dispersive Type



Open Neck Type



Weatherproof Angle Type



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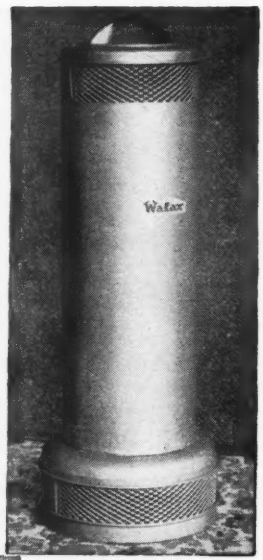

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Operates with 25-40W lamp to make a bed comfortably warm in 15-20 minutes, using less than half a unit of electricity per week. Placed in the bed it forms a tent-like space so that heat is widespread. Finished attractive bronze colour; complete with flex. Weight 1½ lb.; size 6¾″ x 8⅝″. Retail price (without lamp) £1. 4. 0. inc. tax.

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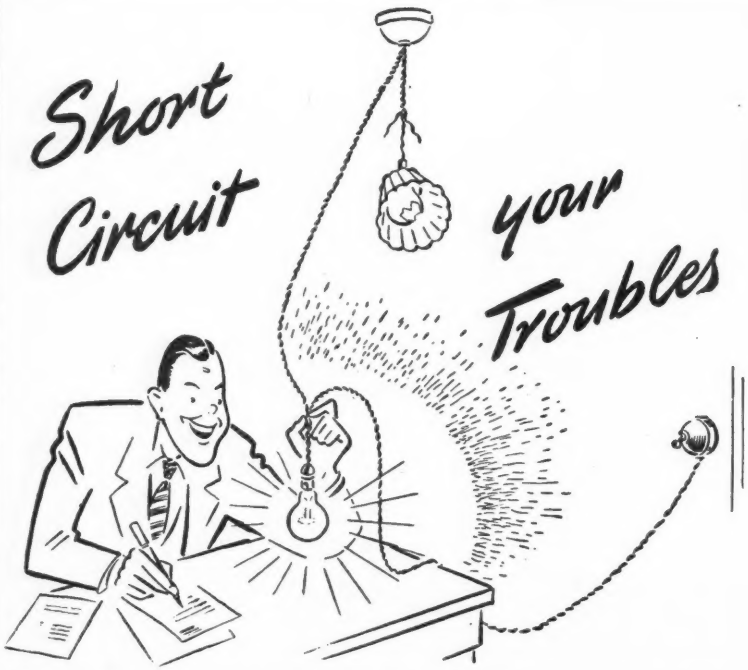

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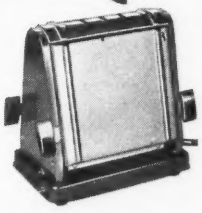
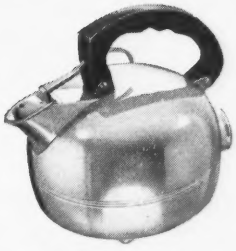
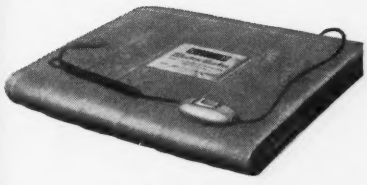


TOASTERS



WHISTLING KETTLES



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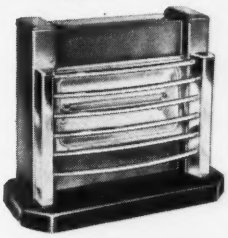
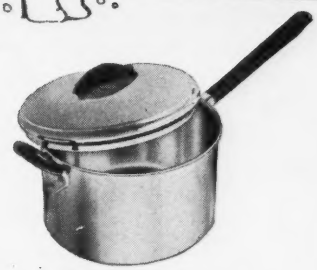


ELECTRIC FIRES



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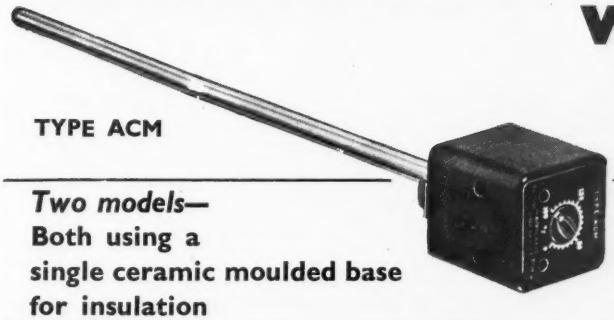

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TYPE MB

TYPE ACM

Enclosed in moulded Bakelite cover which insulates the terminals. Double break; straight-through connections; no current passes through snap spring mechanism.
RATING: 25 amps at 250 volts.
RANGE: 15/90° C. or 60/190° F. for 11 in. STEM.

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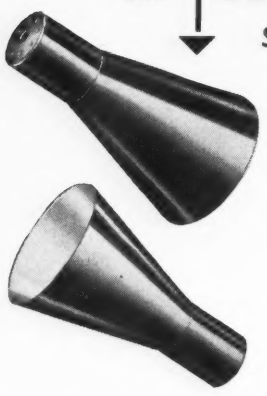

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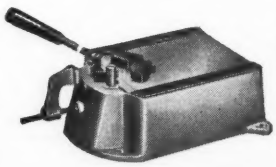

HYDE BENCH-TYPE CABLE STRIPPER

Strips insulation from cables up to ½" outside diameter, no splaying, no nicking, and one single movement does the whole job quickly and cleanly.

The days of clumsy stripping with knife or pliers have gone — the efficient, modern method is to use HYDE wire and cable strippers. Adjustable stops control length of strip. For greater production and perfect results without skill or experience, HYDE strippers are essential.

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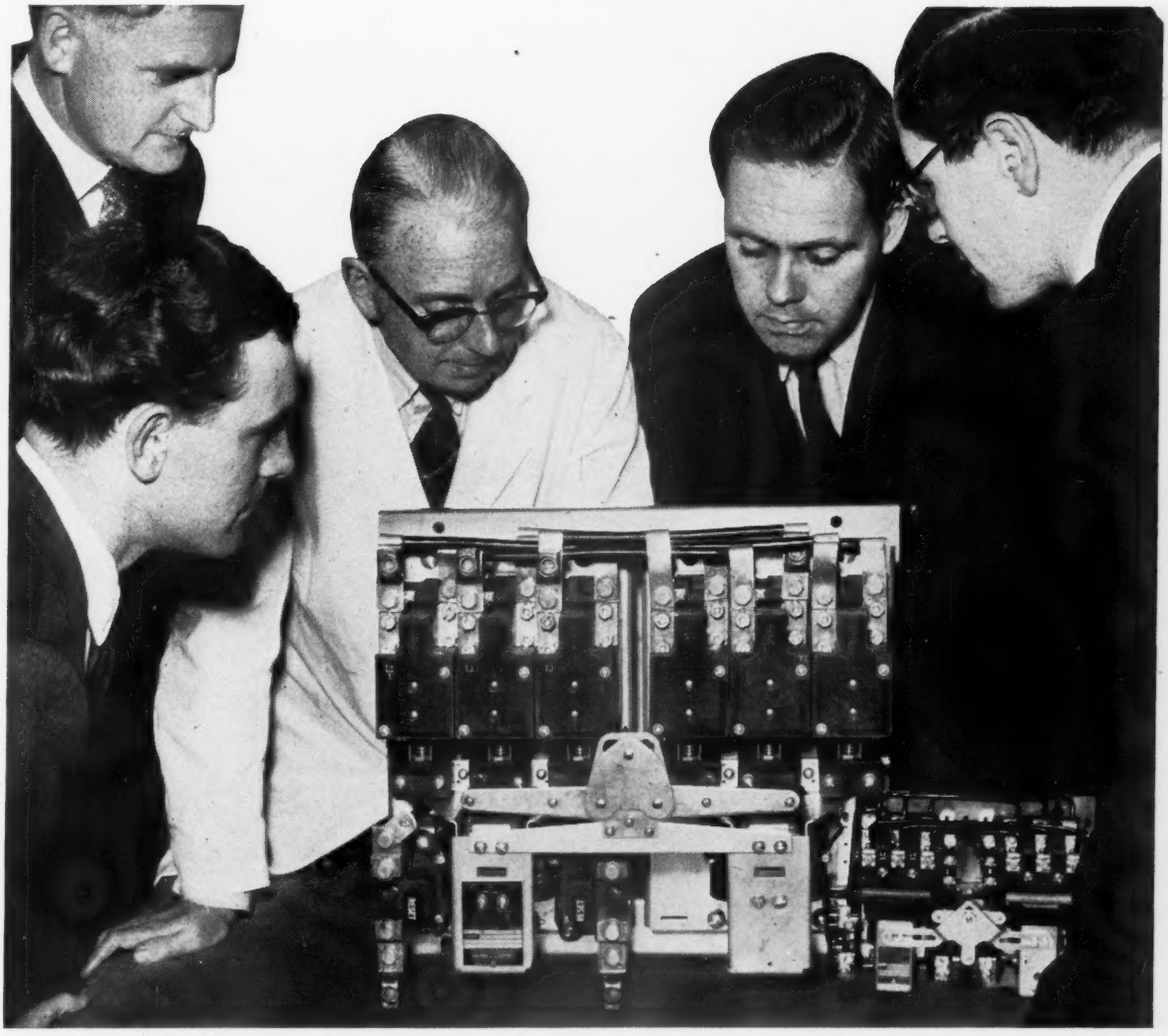

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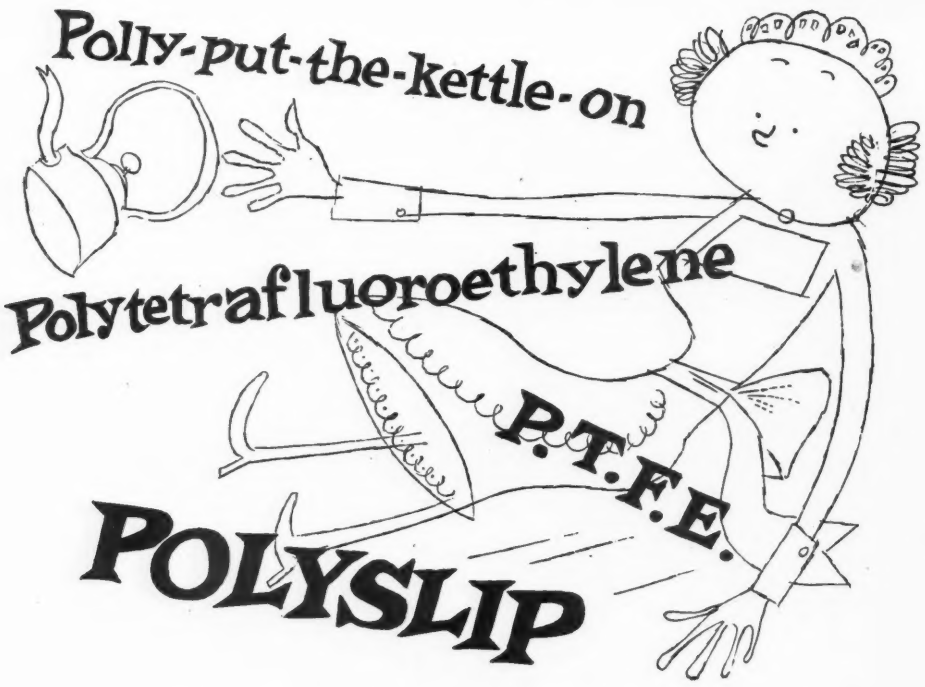

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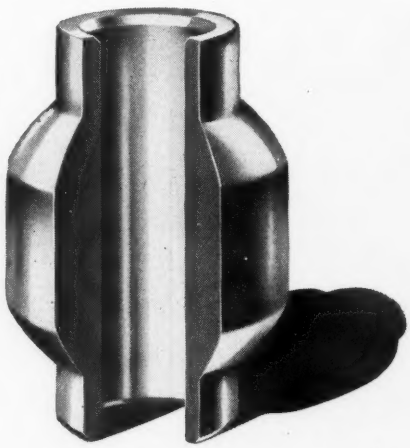

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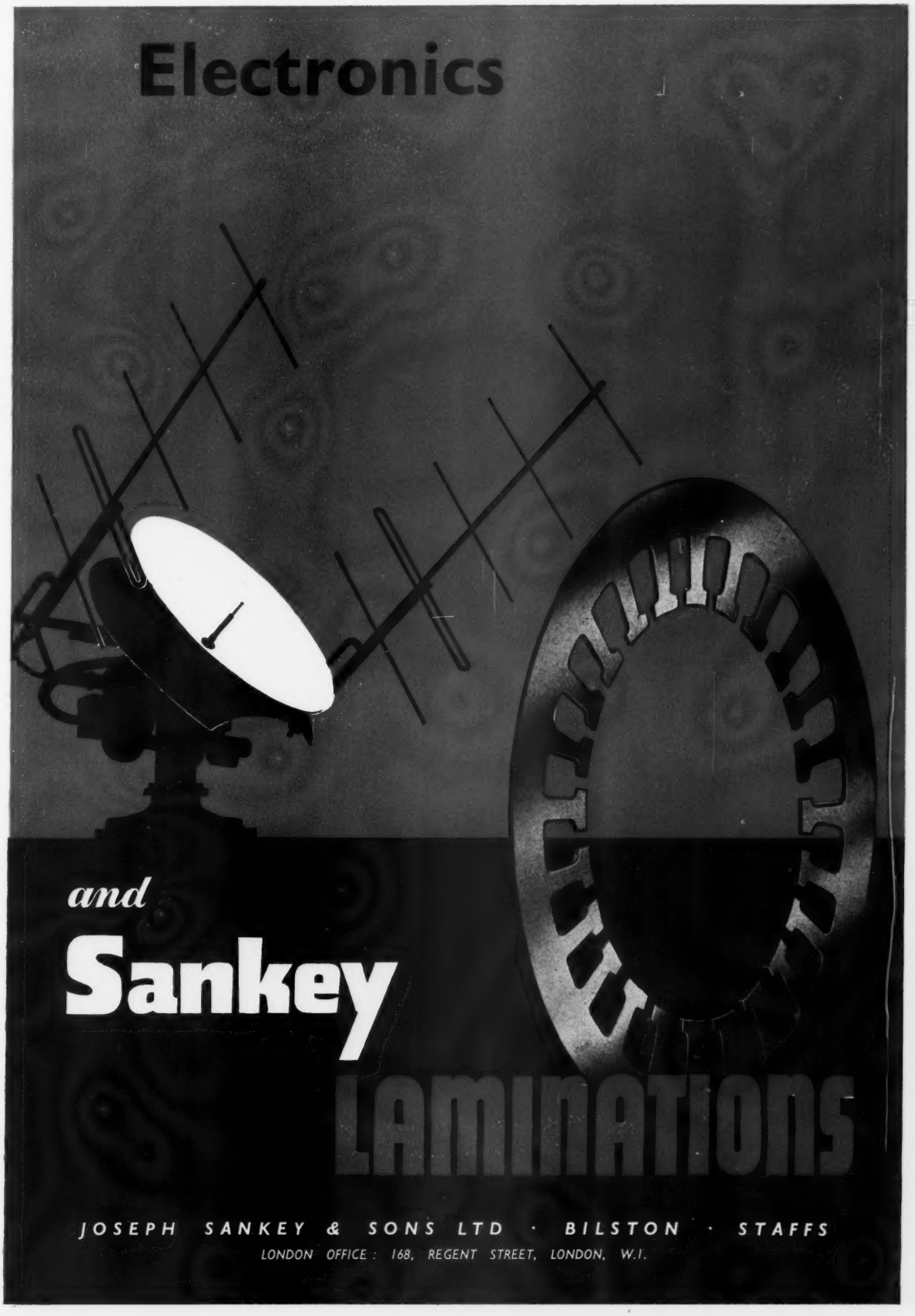
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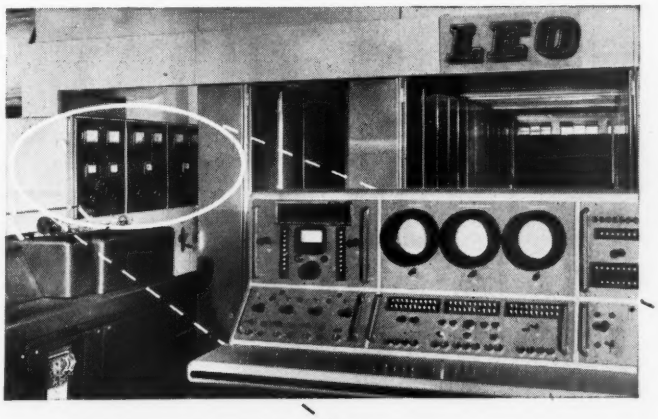

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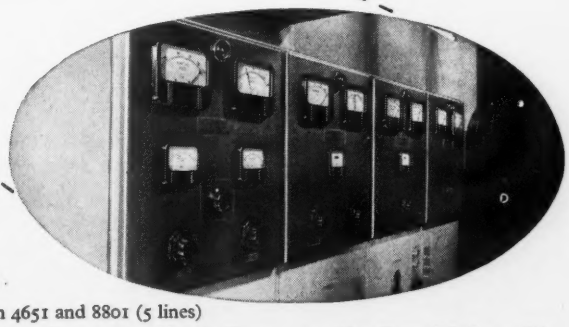

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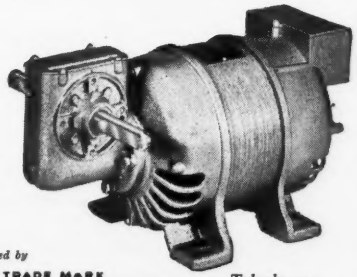

Illustration shows Parvalux S.D.19 Single Reduction Worm Gear Unit with Split Phase Induction motor. 1/8 h.p. with a range of final speeds from 20 to 690 r.p.m.

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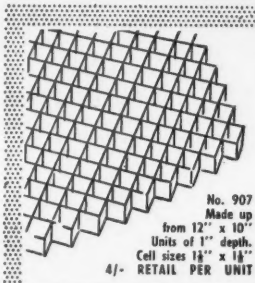

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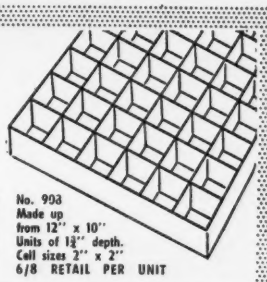

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If it's a *big* job, you can be pretty sure that METALLIC have had something to do with it. Their conduit and fittings are chosen repeatedly by electrical engineers and contractors who know the long-lasting properties of METALLIC tubes, and the reliability of METALLIC fittings.

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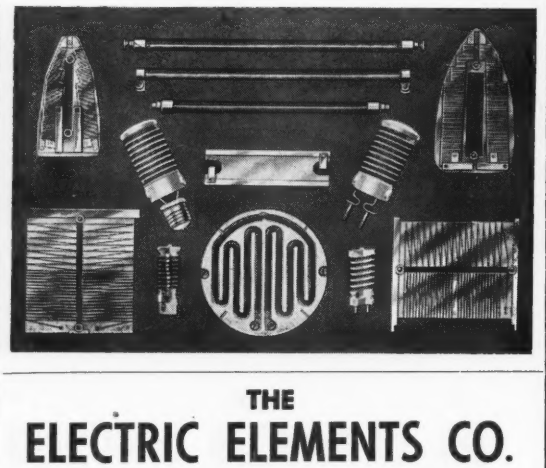
THE METALLIC SEAMLESS TUBE CO., LTD., LUDGATE HILL, BIRMINGHAM 3
AND AT LONDON, NEWCASTLE-ON-TYNE, LEEDS, SWANSEA & GLASGOW

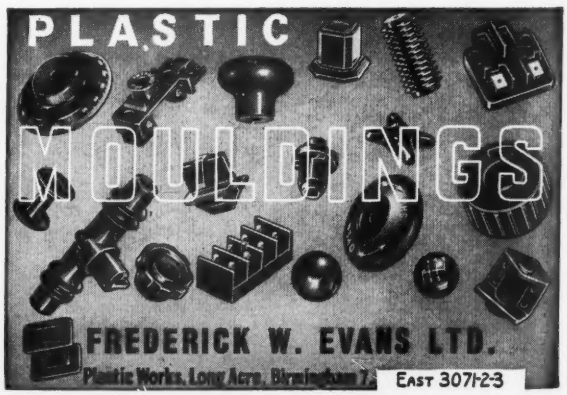
***dependable* ELEMENTS**

for every job

Stocked by Leading Wholesalers



THE ELECTRIC ELEMENTS CO.
Tokenhouse Yard, Nottingham
Makers of Elements since 1921



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then consult us for all types of

MERCURY SWITCHES

We offer completely reliable Switches coupled with good delivery

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QUICKSILVER TUBE MNFG. CO.
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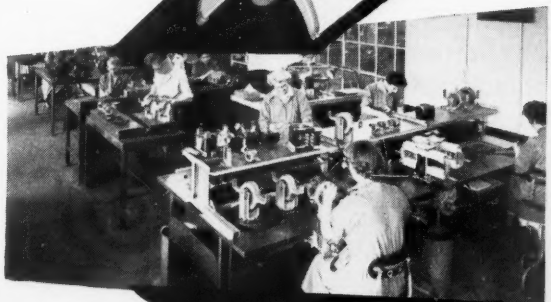

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THE ANSWER IN ONE 'NEW-RANGE'

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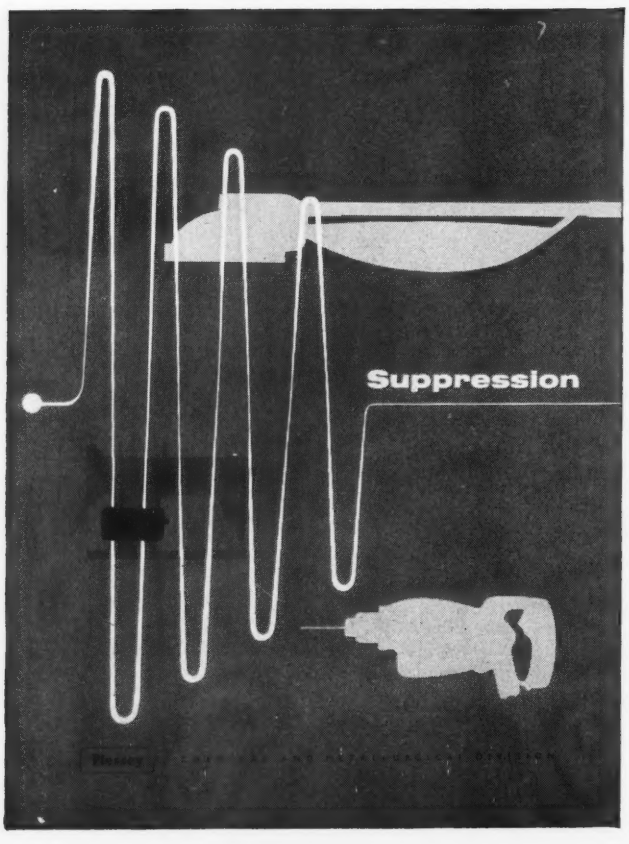
Crompton Parkinson Ltd., Crompton House, Aldwych, London W.C.2. Tel: Chancery 3333. Grams: Crompark Estrand London

on the subject of suppression

This new Plessey publication is designed to assist all those currently concerned with the problems of suppression of all electrical equipment. The book provides Design Engineers with a standard reference to the complete range of suppressors produced by Plessey at Towcester, their individual suitabilities in application, their construction and their operational characteristics. Many illustrations and dimensional diagrams are included. Please ask for Plessey Publication No. 952.



Plessey

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CHEMICAL AND METALLURGICAL DIVISION
THE PLESSEY COMPANY LIMITED
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TOWCESTER, NORTHANTS
TEL: TOWCESTER 312

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PLESSEY INTERNATIONAL LIMITED
ILFORD ESSEX ENGLAND
TEL: ILFORD 3040

TC.1

NEWDAY ELECTRIC *Fan heater*

CONVECTOR HEATERS
The well-known Newday convector Heaters the GLOUCESTER and the CHALFORD available at the following ***PRICES***

	List Price	Purchase Tax
GLOUCESTER	£4.10.3	£1.19.6
Loading 1,500 Watts switched to 750 Watts. Voltage range 200/220 and 230/250.		
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Loading 1 kW. Voltage range 200/220 and 230/250.		

THE COTSWOLD

Replacing the previous STANDARD & DE LUXE models and incorporating the better features of the DE LUXE model, the COTSWOLD is now offered at a greatly reduced price.
The most effective and economical method of fan heating and cooling offering the maximum safety by nature of its totally enclosed elements.
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Cotswold Works, Chalford, Nr. Stroud, Gloucester

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The miniature thermostat with the maximum efficiency

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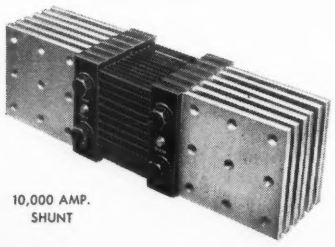

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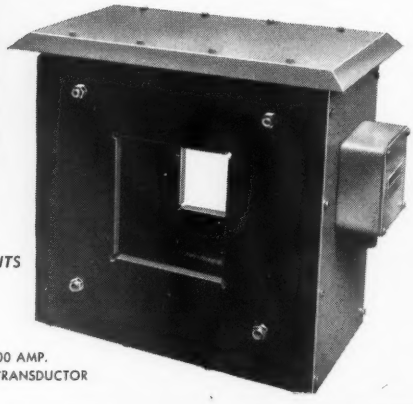

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for use with Moving Coil instruments for currents up to 10,000 amperes to fit customers' bus-bar arrangements.

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These are arranged as direct current transformers through which the bus-bars pass.

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Telephone: Bradford-on-Avon 2378

London Area Office —
2 Hill Street, St. Albans, Herts.
Telephone: St. Albans 51722

Manchester Office —
270/272 Corn Exchange Buildings
Manchester 4
Telephone: Blackfriars 7795

Tyneside Area Office —
Alliance Buildings, 4 Moseley Street
Newcastle-on-Tyne 1

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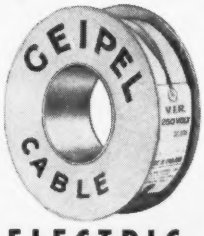

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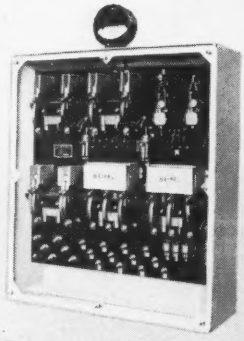

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Standard and Special Equipment

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ESTABLISHED 1871
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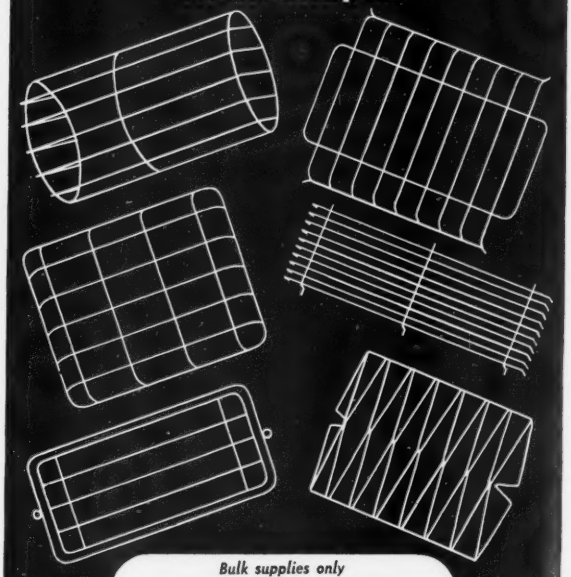

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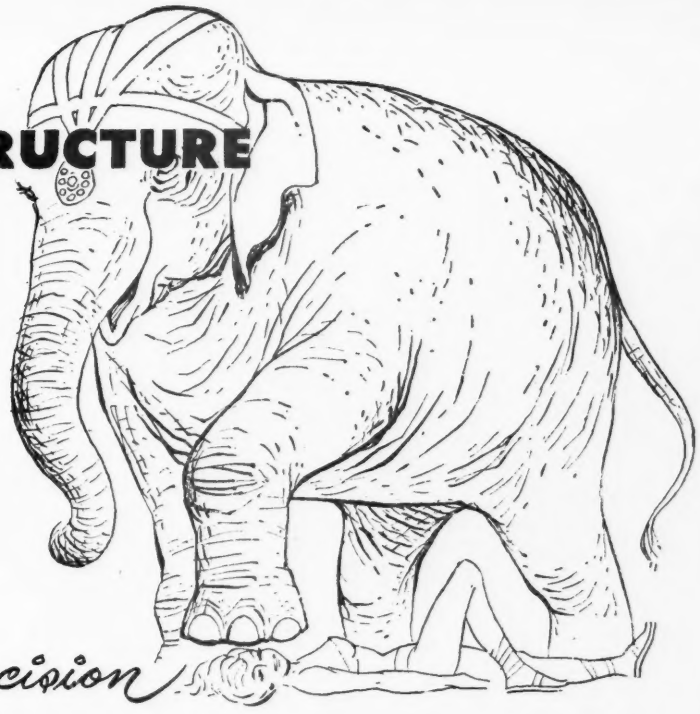
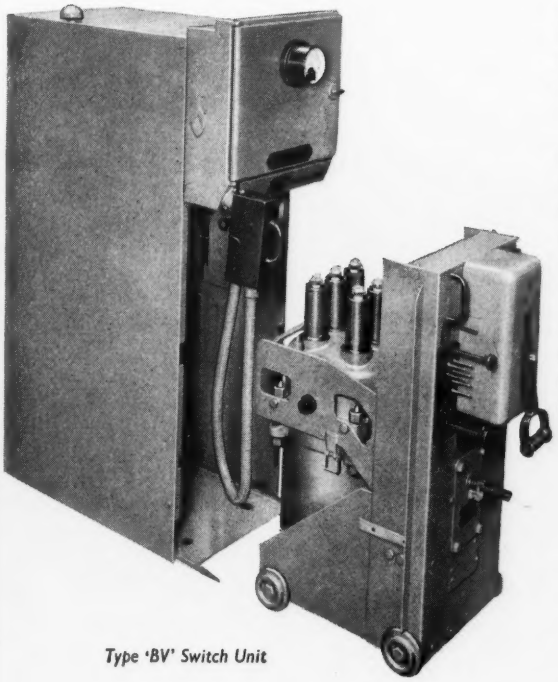


Delicate precision



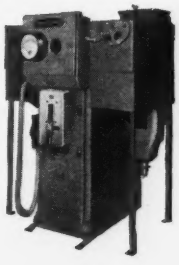
Type 'BV' Switch Unit

The combination of qualities displayed by the circus performers in our pictorial analogy is similar to that called for in Switchgear production, for in Engineering, as in Entertainment, constant effort combined with experience is needed when the common aim is "a satisfactory performance".

ROBUST STRUCTURE is evident in all "Ferguson Pailin" products. This quality, coupled with that equally important characteristic, PRECISION (as applied to the manufacture of components) is essential, for a satisfactory performance in service depends on good design and workmanship.

A striking example of these qualities is illustrated by the "Ferguson Pailin" BV Unit, designed for 11 kV service. This class of switchgear is, in its own category, a household word to most of those engaged in the business of 'power supply' : to those unfamiliar with its virtues, we will be glad to supply full information.

A good example of the adaptability of the "BV" unit is shown here, where it is linked in service with Oil Switch equipment.



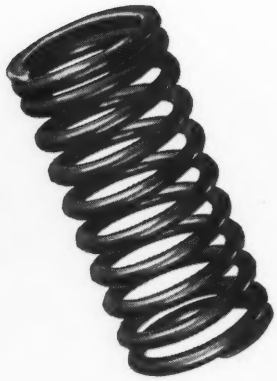
Ferguson Pailin LIMITED *for Switchgear*

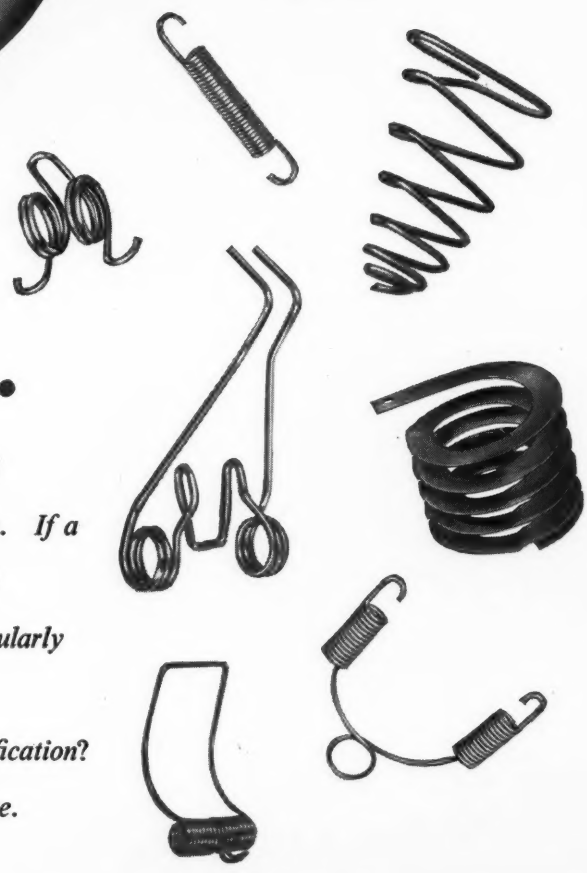
An A.E.I. Company

Head Office & Works: **HR. OPENSHAW MANCHESTER 11,** *Telephone* : DROylsden 1301 (Pte.Branch Ex)

LONDON OFFICE : Bush House, Aldwych, W.C.2 BIRMINGHAM OFFICE : Windsor House, 656 Chester Road, Erdington, 23 GLASGOW OFFICE : Central Chambers, 109 Hope Street, C.2.

REPRESENTED IN PRINCIPAL OVERSEAS TERRITORIES





Let's look into it...

. . . from your point of view and from ours the focus is on reliability. If a spring passes our tests it will pass any that can be imposed and particularly the test of time.

May we quote on your next specification? Our technicians are at your service.

SALTER

...always a spring ahead!

GEO. SALTER & CO. LTD., WEST BROMWICH, ENGLAND . ESTABLISHED 1760

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INSULATED WIRES AND STRIPS

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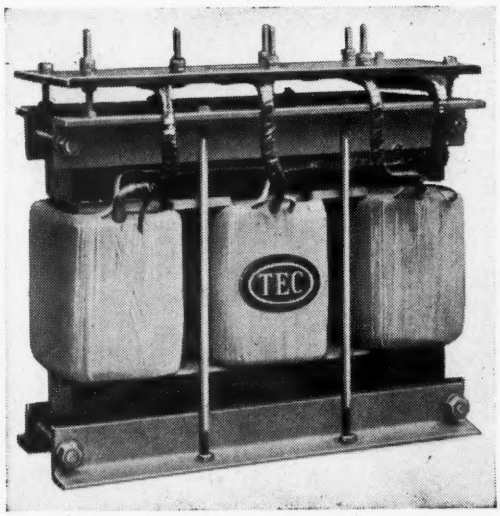
Insist on T.E.C.

5 V.A.-100 K.V.A. TRANSFORMERS AND CHOKES



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The TRANSFORMER & ELECTRICAL CO. LTD.
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Industrial plants need

Victor lighting

HOWEVER SPECIALISED your lighting requirements may be, they can be met from the extensive range of VICTOR lighting fittings. The many types available are fully described and illustrated in our catalogues L600 (weatherproof-flameproof) and L700 (non-flameproof), copies of which will be gladly sent on request.

Free

On-the-spot advice of a VICTOR lighting expert is yours for the asking when planning new installations.

If its lighting—its Victor!

VICTOR PRODUCTS (Wallsend) LTD.
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Telephone: 68331 (6 lines) *Telegrams: "Victor" Wallsend*
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FOR THE 500,000th

ATLAS Popular PACK

To celebrate the production of the 500,000th Popular Pack a Ferguson Fantasia II Radiogram will be presented free to the ultimate purchaser of the pack. Enclosed with the 500,000 pack, which is now being distributed, is a certificate and letter stating how this fine gift should be claimed.

Magnificent Radiogram FREE

ATLAS LIGHTING LIMITED
A subsidiary company of Thorn Electrical Industries Limited
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The DYNO-SIREN

FIRE ALARM OR WARNING SYSTEM

TYPE A
HIGH FREQUENCY NOTE

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ULTRA HIGH FREQUENCY NOTE

AC/DC ANY VOLTAGE

TOTALLY ENCLOSED BALL BEARINGS

6⅜" HIGH x 3¾" DIAMETER

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DYNAMO & ELECTRICAL SERVICES LTD.

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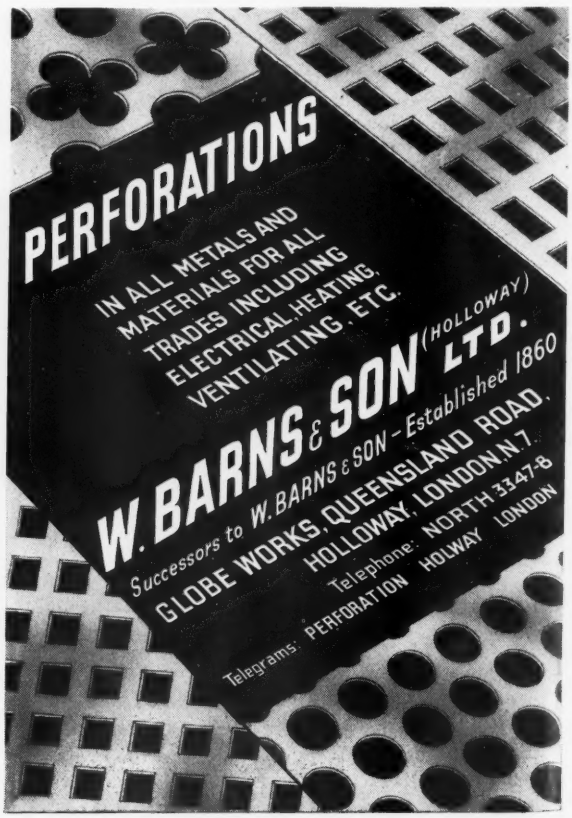
Phone: BLACKBURN 44458/9/50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The Richardsons Westgarth Group

have . . . built some of the most efficient steam turbines and boilers ever put into a British or any other Generating Station, be it National or Industrial.

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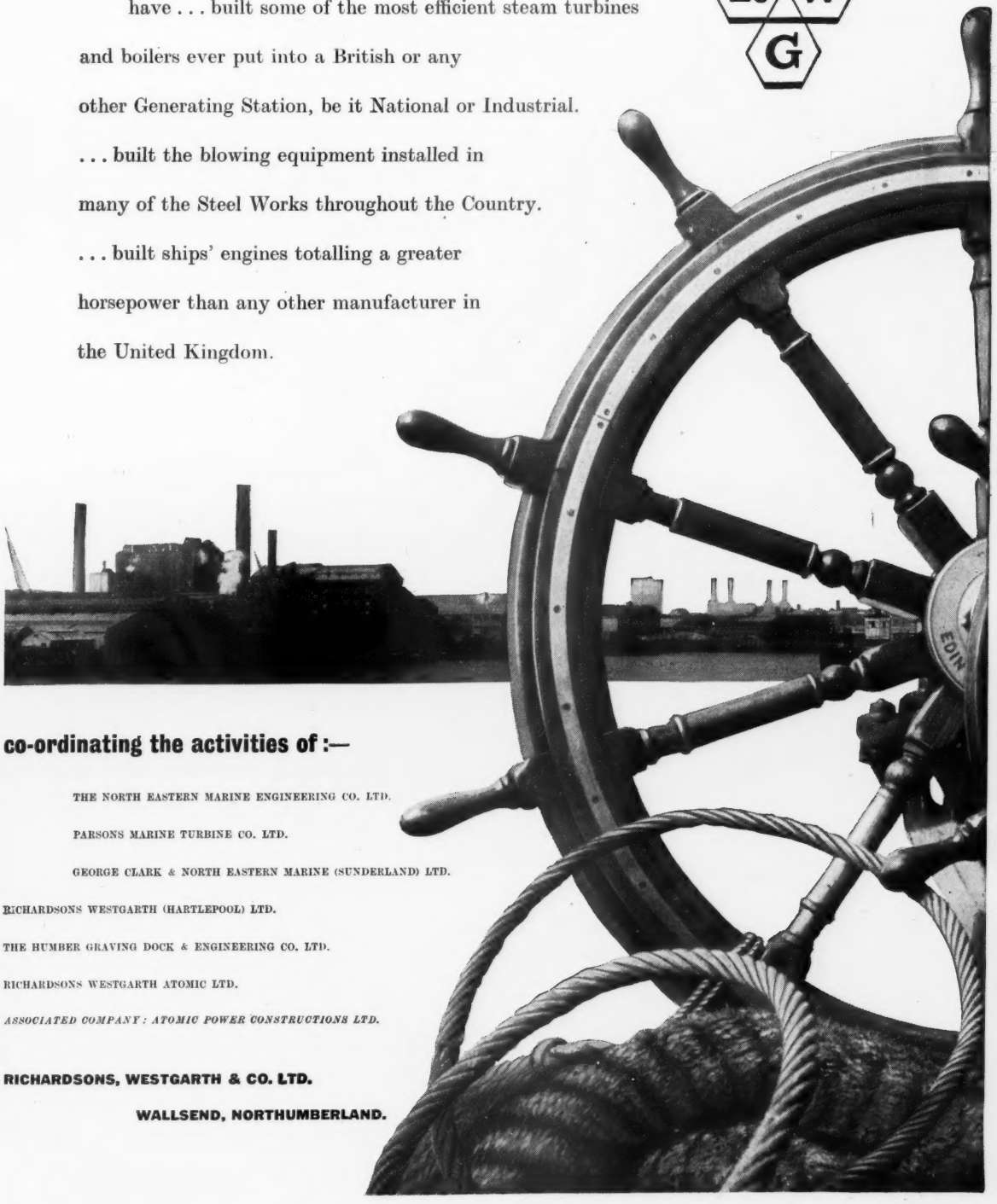

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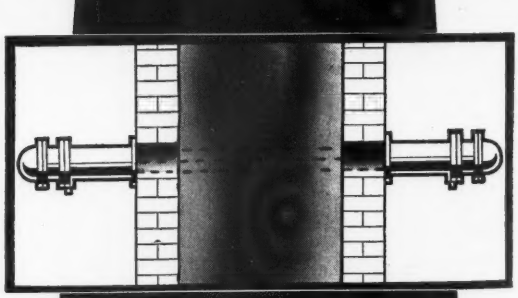
A MATTER OF URGENCY FOR EVERYONE

The G.E.C. Photoelectric Smoke Density Monitor has been designed, in the interest of smoke abatement, to monitor the density of smoke in a stack. A light beam is projected across the stack. Visual and audible alarm systems operate whenever the density exceeds a pre-set level, the event being recorded. The circuit is designed so that, wherever possible, failures of components set the warning relay to the alarm position.

- *Constructed to comply with BS 2740/1956.*
- *Suitable for spans of 1 ft. to 10 ft.*
- *All enclosures are weatherproof and of cast construction.*
- *Stabilised power supply to projector and receiver.*
- *Projector intensity is electrically adjustable for varying operational conditions.*
- *Calibration by means of one simple adjustment.*
- *Provision for an air flow over the glass slides reduces deposits of soot thus minimising manual cleaning.*

For further details, please write for Publication OV 3865



THE GENERAL ELECTRIC CO LTD · MAGNET HOUSE · KINGSWAY · LONDON · WC2

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CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

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SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

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REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

CITY OF LEEDS

Waterworks Department

Eccup Filtration Works and Pumping Station

Contract No. 422: Electric Floor Heating

THE Waterworks Committee of the Leeds City Council invites TENDERS for the SUPPLY, DELIVERY AND INSTALLATION OF AN ELECTRIC FLOOR HEATING SYSTEM AND WORK CONNECTED THEREWITH.

Plans, specification and form of tender may be obtained upon application to the General Manager and Engineer, Waterworks Department, Civic Hall, Leeds, 1.

Forms of agreement and conditions of contract, and general conditions of contract (home contracts—with erection) published by the Institution of Electrical Engineers, may be seen at the Waterworks Department, Room 14, Civic Hall, Leeds, 1.

The Waterworks Committee does not bind itself to accept the lowest or any tender.

Tenders must be enclosed in plain sealed covers endorsed "Tender for Floor Heating, Waterworks," and be delivered at the Town Clerk's Office, Room 57, Civic Hall, Leeds, 1, not later than 12 NOON on MONDAY, the 6th JANUARY, 1958.

KENNETH L. FORSTER, M.I.C.E.,
General Manager and Engineer.

Civic Hall,
Leeds, 1.
8th November, 1957. 1279

INDIA STORE DEPARTMENT

THE Director General, India Store Department, invites tenders for supply of a substantial quantity of Railway Electrical and Power Signalling Equipment, i.e.:—

Relays Track and various, Signal Colour Lights various aspects, Point and Signal Machines, Lever Locks, Signal Arms, Point Indicators Luminous, Key Transmitters Hepper's Type, Signal Reversers, Treadles, Stationmaster's Control (frame slide type), etc., etc.

N.B.—Para. 1, page 17 of tender. Firms may quote on the basis of their own specification for equipments which are in use in their country or any other country and need not necessarily be to British Standard Specification, etc., etc.

Tenders may be obtained from the India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, at a cost of 15s. each (which is not refundable), quoting reference S.2765/57/CDN/FD.

Tenders should be received in the office of the Director General of Supplies and Disposals, Shahjahan Road, New Delhi, by 1 p.m. on 31st December, 1957. 1278

COUNTY BOROUGH OF CROYDON

To Electrical Contractors

TENDERS are invited for installing Power Plug Sockets and other electrical work in pre-war Council houses.

Particulars from Housing Manager, 71, Park Lane, Croydon, on payment of one guinea, which will be returned on receipt of a bona fide tender.

Tenders must reach me by 12 noon on 27th November, 1957.

E. TABERNER,
Town Clerk. 1259

FAREHAM URBAN DISTRICT COUNCIL

Street Lighting, Trunk Road A.27

TENDERS are invited for the supply and erection of Group A Street Lighting installation for approximately 2,250 yards of Trunk Road as under:—

Section A.
(a) Supply and erection of steel columns and fitting and wiring electrical equipment, etc., offered in the firm's own tender.
(b) Supply and erection of steel columns and fitting and wiring electrical equipment, etc., provided by another firm.

Section B.
Supply of lanterns, lamps and electrical equipment.

The specification, bill of quantities and forms of tender may be obtained from, and conditions of contract and drawings inspected at, the office of the Engineer and Surveyor, Westbury Manor, Fareham, Hants, on payment of a deposit of £2 2s., which is returnable on receipt of a bona fide tender, not subsequently withdrawn, and the return of all documents.

Tenders in the envelopes provided and endorsed "Tender for Street Lighting" must be delivered to me by 10 a.m. on Monday, 9th December, 1957.

The Council do not bind themselves to accept the lowest or any tender.

B. W. RANDS,
Clerk to the Council.

Merton,
5, Grove Road,
Fareham, Hants. 1260

COUNTY BOROUGH OF READING

To Electrical Contractors

FIXED price tenders are invited for the installation of Electric Wiring to 308 occupied houses on the Whitley Estate.

House and site plans, specification and form of tender can be obtained from the Borough Architect, Town Hall, Reading, at whose offices the general conditions of contract may also be inspected.

Tender to reach Town Clerk, Town Hall, Reading, by noon Friday, 6th December, 1957. No tender will be considered unless enclosed in the endorsed envelope provided bearing no indication of the sender.

The Corporation do not bind themselves to accept the lowest or any tender. 1226

CORPORATION OF THE CITY OF ABERDEEN

Lighting Department

TENDERS are invited for the supply of Electric Lamps to the Aberdeen Corporation Lighting Department during the year 1958.

Tender forms and details may be obtained from the Superintendent of Lighting, 262, King Street, Aberdeen, to whom tenders should be submitted on or before 9th December, 1957.

J. C. RENNIE,
Town Clerk.

Town House,
Aberdeen.
5th November, 1957. 9197

CLASSIFIED ADVERTISEMENTS
ARE PREPAID

BOROUGH OF COLWYN BAY

Trunk Road A.55: Lighting

Section 4, Dingle Bridge to Brompton Avenue

TENDERS are invited for the following works required in the lighting of approximately 1½ miles of Trunk Road in the Borough:

1. The provision and erection of 60 Class A Lighting Columns.
2. The provision and fixing of Lanterns, Control Gear and other equipment.

Separate tenders will be considered for Items 1 and 2 or for the whole of the works. The Council wishes to consider tenders for both steel and concrete columns, and alternative bills of quantities are therefore included in the tender documents.

Plans may be inspected and copies of the tender documents obtained upon application to Mr. H. Wilman, A.M.I.C.E., Borough Engineer and Surveyor, Whalley Range, Lansdowne Rd., Colwyn Bay.

Tenders in plain sealed envelopes, endorsed "Trunk Road Lighting, Section 4," must be delivered to the undersigned not later than 12 noon on Saturday, 30th November, 1957.

The Council do not bind themselves to accept the lowest or any tender.

HAROLD E. BRAITHWAITE,
Town Clerk.

Town Hall,
Colwyn Bay.
29th October, 1957. 1125

BOROUGH OF HESTON AND ISLEWORTH

Street Lighting Improvement

Great South West Road A.30

TENDERS are invited for the installation of Street Lighting to Group "A" standard along the Great South West Road A.30 from its commencement to the Borough boundary, including removal of existing columns and supply and erection of 32 steel columns with mercury vapour lamps and control gear.

On deposit of £2 2s. (returnable if a bona fide tender is received and not withdrawn) the bill of quantities, specification and form of tender may be obtained from, and conditions of contract and drawings may be seen at, the Borough Engineer's Department, 88, Lampton Road, Hounslow.

Tenders, in sealed envelopes endorsed "Tender, Great South West Road Lighting," but not indicating the sender, must be delivered to me by 10 a.m. on the 11th December, 1957.

The Council are not bound to accept any tender.

D. MATHIESON,
Town Clerk.

Town Hall,
Hounslow, Middlesex. 1271

SITUATIONS VACANT

H. J. HEINZ CO. LTD.

have a vacancy for a DRAUGHTSMAN for Electrical Services.

Applicants should be aged 25-40, with a minimum of 5 years' drawing office experience, and be familiar with all aspects of main and subsidiary electrical services, and should preferably be of H.N.C. standard.

Please apply to the Personnel Officer, H. J. Heinz Co. Ltd., Waxlow Road, Harlesden, London, N.W.10. 1213

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or B. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for posts (a) an advantage.

(a) ASSISTANT ENGINEER (Control),
HACKNEY POWER STATION
(Vacancy No. 57/1006).

Applicants will be expected to undertake control room duties in the "A" Station control, with responsibility for synchronising load control and the necessary switching operations. Salary Class H, Grade 12 = £780 plus £74 shift p.a.

SECOND ASSISTANT ENGINEER
(Construction),
CONSTRUCTION DEPT.
(Vacancy No. 57/1007).

To carry out general administrative duties in connection with generation construction projects both in the planning stages and in supervision of erection at sites. Duties demand character, personality, general ability and resourcefulness as well as some specialist engineering knowledge. Applicants should be conversant with generating station plant and preferably have some experience of constructional procedure. They should also be capable of preparing minutes of meetings and reports. Applicants should be corporate members of at least one of the three major institutions or have equivalent qualifications. Salary Class AX/EX, Grade 4 = £1,195/£1,460 p.a.

THIRD ASSISTANT ENGINEER
(Mechanical),
CONSTRUCTION DEPT.
(Vacancy No. 57/1008)

Applicants should preferably have theoretical and practical training in mechanical engineering to standard approaching that required for A.M.I.Mech.E. or equivalent, with some experience in design, manufacture and installation of mechanical plant and equipment for modern power stations. They should also have some experience of constructional procedure. Salary Class AX/EX, Grade 6 = £945/£1,190 per annum.

THIRD ASSISTANT ENGINEER
(Electrical),
CONSTRUCTION DEPT.
(Vacancy No. 57/1009).

Applicants should have theoretical and practical training in electrical engineering to the standard required for A.M.I.E.E., preferably with experience in design, manufacture and installation of electrical plant and equipment required in modern power stations. Experience in preparation of specifications and estimates will be an added advantage. Salary Class AX/EX, Grade 6 = £945/£1,190 p.a.

(a) THIRD ASSISTANT ENGINEER,
CHIEF GENERATION ENGINEER'S (O) DEPARTMENT
(Vacancy No. 57/1010).

Candidates should possess a good general and technical education with some experience of power station operation. Duties will include compilation of technical reports and assisting in preparation and progressing of overhaul programmes. Clarity of expression and ability to write concise and readable reports are essential qualifications. A comprehensive covering letter should accompany application form. Salary Class AX/EX, Grade 6 = £945/£1,190 p.a.

FOURTH ASSISTANT ENGINEER,
UTILIZATION RESEARCH SECTION,
TECHNICAL DEPARTMENT,
95, PARK STREET, SOUTHWARK,
LONDON, S.E.1
(Vacancy No. 57/1011).

Engaged in testing and maintenance of single and polyphase pen recording, indicating and integrating instruments, and instrument transformers, both in test room, on site and possibly for short periods out of London at discretion of Authority. Salary Class AX/EX, Grade 8 = £750/£985 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Authority, London Division, P.O. Box 136, London, W.1, by 25th November, 1957. 1242

CENTRAL ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following vacancies in this Division :—

ASSISTANT ENGINEER
(Electrical R. & M.),
COVENTRY POWER STATION
(Vacancy No. 195/57/ER).

Applications from suitably qualified engineers are invited. Applicants should have served an apprenticeship and had good experience in maintenance of all electrical machines and equipment in a modern power station.

Salary in accordance with Class G, Grade 8 (£885-£930 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 27th November, 1957.

SHIFT CHARGE ENGINEER,
DRAKELOW POWER STATION
(Vacancy No. 196/57/ER).

Candidates should be suitably qualified and have had experience with large-capacity high-pressure turbo-alternators and pulverised fuel fired boilers.

Applicants should be in possession of technical qualifications admitting to Corporate Membership of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers.

Salary will be in accordance with Class J, Grade 7 (£1,065-£1,140 per annum) of the National Joint Board Agreement plus 10% shift enhancement.

Closing date for receipt of applications, 27th November, 1957.

FIRST ASSISTANT CHEMIST,
NORTHAMPTON POWER STATION
(Vacancy No. 198/57/ER).

Previous experience in a power station laboratory is desirable and candidates should hold the Higher National Certificate in Chemistry.

Candidates must be familiar with the methods of sampling and analysis of coal, water and oil, and with the interpretation of the analytical results.

Salary will be in accordance with Class G, Grade 9 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 27th November, 1957.

SHIFT CHARGE ENGINEER,
BURTON-ON-TRENT
POWER STATION
(Vacancy No. 199/57/ER).

Sound technical training and practical experience in the control and operation of steam generating plant and main switchgear are required. Appropriate qualifications an advantage.

Salary in accordance with Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 27th November, 1957.

GENERAL ASSISTANT ENGINEER
(Chemist),
LINCOLN POWER STATION
(Vacancy No. 204/57/ER).

Candidates must have had a sound technical training and some previous experience in an industrial laboratory and should hold the Ordinary National Certificate in Chemistry.

The duties will include the routine analysis of coal, water and oil, but the post offers opportunities of gaining general experience in the chemical control of power station operation.

Salary will be within the range £540-£680 per annum in accordance with the National Joint Board Agreement.

Closing date for receipt of applications, 4th December, 1957.

These appointments will be pensionable within the provisions of the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

L. F. JEFFREY,
Divisional Controller.

6th November, 1957. 1239

CITY OF SALISBURY, SOUTHERN RHODESIA

Electricity Department

Vacancy for Technical Assistant, Grade 1

APPLICATIONS are invited for the fixed establishment post of TECHNICAL ASSISTANT GRADE 1 in the Street Lighting Section of the City of Salisbury Electricity Department on the salary scale £1,225 × £50 to £1,525 per annum. Commencing salary is at the minimum of the grade and no cost-of-living or other allowances are payable.

Candidates must have a sound technical training and practical experience in electrical engineering, with at least 8 years' experience in street lighting, preferably with a municipal undertaking. They must be conversant with street lighting codes of practice and will be responsible for carrying out design and installation work on street lighting schemes and for organising the maintenance programme on all street lighting equipment. They must be neat draughtsmen and capable of preparing all types of working drawings and plans required in the above-mentioned work. Higher National Certificate, Graduate Membership of the Institution of Electrical Engineers, or Associated Membership of the Institution of Public Lighting Engineers would be an advantage.

The appointment will be subject to the Council's service and leave regulations, and the successful applicant will be required to furnish a satisfactory medical certificate of fitness. He must also be able to comply with the requirements of the immigration authorities.

Candidates are requested to submit full particulars of their qualifications, training and experience, which should include details of positions held and salaries received. Age, place of birth, nationality, and marital state should also be given, and copies of not more than three recent testimonials may be included.

Further particulars regarding conditions of service, leave entitlement, allowances towards travelling and removal expenses are obtainable from Davis & Soper Ltd., 52 & 54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 29th November, 1957. 1130

FEDERATION OF RHODESIA AND NYASALAND

Federal Power Board

Appointment of Operations Controller

THE Board require the services of an OPERATIONS CONTROLLER who should be a fully qualified Electrical Engineer with wide knowledge of all aspects of the operation of electricity supply systems, including the commercial aspects, and who should possess executive experience.

The Board are at present constructing at the Kariba Gorge on the Zambezi a large dam and power station having an initial capacity of 500 MW and an ultimate capacity of at least 1,200 MW. The Board are also constructing about 930 miles of 330-kV transmission line to connect the Kariba power station with a number of thermal stations in the Federation. The Operations Controller is required in connection with the operation of this integrated system.

Salary £3,500 per annum. There is a pension scheme which the successful applicant will be required to join.

Applications should be posted so as to reach the Secretary, Federal Power Board, Reliance House, P.O. Box 630, Salisbury, Southern Rhodesia, not later than 31st December, 1957.

1297

SENIOR SCIENTIFIC OFFICERS; SCIENTIFIC OFFICERS

THE CIVIL SERVICE COMMISSIONERS invite applications for pensionable appointments covering a wide range of scientific research and development in most of the major fields of fundamental and applied science. In Biological subjects the number of vacancies is small: individual vacancies exist in the Natural History Museum for candidates who have special knowledge of, or who are interested in, taxonomic entomology, palæontology.

The Royal Naval Scientific Service requires a Scientific Officer (male) for the National Institute of Oceanography to work on oceanic Cephalopoda; and a vacancy for a Metallurgist (Scientific Officer) has arisen in the Royal Mint.

Candidates must have obtained a university degree with first or second class honours in an appropriate scientific subject (including engineering) or in mathematics, or an equivalent qualification, or be otherwise qualified by high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' postgraduate or other approved experience.

Age limits: Senior Scientific Officers, between 26 and 31, but specially suitable candidates under 26 may be admitted; for Scientific Officers, between 21 and 28 during 1957 (up to 31 for permanent members of the Experimental Officer class).

Salary (London): Senior Scientific Officers, minimum £1,190 (women £1,098); men's scale maximum £1,410. Scientific Officers, minimum £635; men's scale maximum £1,110. Women's pay above £635 slightly lower but being raised to reach equality with men's in 1961. Somewhat lower rates in the Provinces. 5-day week, generally.

Further particulars from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1, quoting No. S.53/57 for Senior Scientific Officers and S.52/57 for Scientific Officers.

Interview boards will sit at intervals, as required. Early application is advised. 1261

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Planning)

Bournemouth District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class H, Grade 9 (£885 × £15 to £930 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks, and will be required to carry out standby duties if and when called upon to do so. Applicants should have had sound experience in electricity supply distribution, and the possession of suitable technical qualifications would be an advantage.

General Assistant Engineers (Two Vacancies)

Bournemouth District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class H, Grade 11 (£790 × £15 to £835 per annum), N.J.B. conditions of service.

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems. Experience in planning and the possession of suitable technical qualifications would be advantages. Standby duties will be involved.

General Assistant Engineers (Two Vacancies)

Bournemouth District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class H, Grade 12 (£740 × £15 to £785 per annum). N.J.B. conditions of service.

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems. The possession of suitable technical qualifications would be advantageous. Standby duties will be involved.

Assistant Engineer (Planning)

Southampton District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class G, Grade 9 (£835 × £15 to £880 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks, and will be required to carry out standby duties if and when called upon to do so. Applicants should have had sound experience in electricity supply distribution, and the possession of suitable technical qualifications would be an advantage.

Assistant Engineer (Maintenance and Operation)

Southampton District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class G, Grade 9 (£835 × £15 to £880 per annum). N.J.B. conditions of service.

The duties of the post will be to assist the Maintenance and Operation Engineer, principally with the maintenance and operation of H.V. and L.V. overhead and underground distribution systems working at voltages up to 33,000. Experience in D.C. to A.C. changeover work and the possession of suitable technical qualifications would be advantages. The successful candidate will be required to carry out standby duties if and when called upon to do so.

General Assistant Engineer

Southampton District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class G, Grade 11 (£740 × £15 to £785 per annum). N.J.B. conditions of service.

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems. The possession of suitable technical qualifications would be advantageous. The successful candidate will be required to carry out standby duties if and when called upon to do so.

The successful candidates for the above appointments will be required to contribute to the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme, if eligible.

Applications for the above appointments on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him in envelopes suitably endorsed, not later than 25th November, 1957. 1296

ELECTRICAL ENGINEERING DRAUGHTSMAN

APPLICANTS should have experience in design and layout of factory electrical services, motor control gear, circuit diagrams and instrumentation, and should preferably hold H.N.C. in Electrical Engineering or equivalent.

This position offers the suitably qualified young man the opportunity to grow in responsibility and experience in a new and progressive organisation.

A superannuation and free life assurance scheme is in operation.

Please apply to Manager, Personnel and Employee Services,

CATERPILLAR TRACTOR CO. LTD.

Tannochside, Uddingston, Glasgow.

1290

DENBIGHSHIRE COUNTY COUNCIL

County Architect's Department, Wrexham

ELECTRICAL ENGINEERING ASSISTANT required for preparing, under supervision, schemes, working drawings, specifications and estimates for modern electrical installations for all types of public buildings. Preference will be given to Graduate or Associate Members of the Institution of Electrical Engineers. Commencing salary will be within either A.P.T. Grade III or the special scale £750-£1,030, according to the qualifications and experience of the successful candidate.

Application forms may be obtained from me. Completed application forms to be received by me not later than 23rd November, 1957.

W. E. BUFTON,
Clerk of the Council.

County Offices, Ruthin. 1302

SOUTH EASTERN ELECTRICITY BOARD

FITTER (Electrical),
Kingston and District.

Wages 4s. 1½d. per hour for 44-hour week under N.J.I.C. Agreement. The duties will include the maintenance, repair and erection of E.H.V. and M.V. switchgear and transformers.

Applications, naming two referees, to D. C. Thomson, B.Sc., M.I.E.E., Kingston and District Manager, SEEBOARD, 22, Claremont Road, Surbiton, by 25th November, 1957.

ASSISTANT DISTRICT ENGINEER,
Medway District.

Annual salary £790-£835 under N.J.B. Class F, Grade 9. Superannuable. Applicants should have had a good general education and be technically trained up to Higher National Certificate standard and must have had practical training and experience in general distribution work for systems up to 11 kV.

Applications, naming two referees, to Ramsden Mellor Esq., M.I.E.E., A.I.Mech.E., District Manager, SEEBOARD, Gardiner Street, Gillingham, Kent, by 27th November, 1957.

ASSISTANT DISTRICT ENGINEER,
Kingston and District.

Salary £835-£880 per annum under N.J.B. Schedule Class G, Grade 9, plus London weighting. Superannuable. Applicants should hold the Higher National Certificate in Electrical Engineering or its equivalent, and have had practical experience in general distribution work on systems up to 11 kV.

Applications, naming two referees, on forms from D. C. Thomson, B.Sc., M.I.E.E., Kingston and District Manager, SEEBOARD, 22, Claremont Road, Surbiton, Surrey, by 27th November, 1957.

SECOND ASSISTANT DISTRICT ENGINEER,
Weald District.

Annual salary £835-£880 under N.J.B. Class E, Grade 7. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead systems up to 33 kV.

Applications, naming two referees, to W. J. Collins, A.M.I.E.E., District Manager, SEEBOARD, Highgate, Hawkhurst, Kent, by 27th November, 1957.

A. L. BURNELL,
Secretary.

1292

DESIGN ENGINEER

MOTOR CONTROL GEAR

ESTABLISHED manufacturing company requires engineer experienced in design of contactors and auxiliaries, capable of producing, if necessary from theoretical considerations, electrically and mechanically sound designs which accord with modern manufacturing techniques.

Wide knowledge of applications essential.

Senior position, carrying appropriate salary, etc.

Write, giving details of age, experience and qualifications, to—Box 1131.

DEVELOPMENT ENGINEERS

VACANCIES exist with an old-established Birmingham company for engineers of experience and proved ability for work on product development in the field of gas and electric domestic appliances.

The company is prepared to consider applications under two headings:—

(a) The possession of an Engineering Degree or corporate membership of appropriate institution.

(b) The possession of Higher National Certificate in Mechanical or Electrical Engineering, plus an appropriate apprenticeship.

The positions are permanent and pensionable, carrying good salaries.

Apply, in confidence, to Personnel Manager, Box 1230.

***Situations Vacant** (continued)*

NEW ZEALAND GOVERNMENT

State Hydro-Electric Department

Mercer Steam Power Station
Wairakei Geothermal Steam Power Station

APPLICATIONS are invited for the following positions :—

STATION SUPERINTENDENT, Mercer.
Salary £1,340/£1,465 p.a.

ASSISTANT STATION SUPERINTENDENTS (2), Mercer.
Salary £1,080/£1,225 p.a.

STATION SUPERINTENDENT, Wairakei.
Salary £1,225/£1,340 p.a.

ASSISTANT STATION SUPERINTENDENT, Wairakei.
Salary £1,040/£1,150 p.a.

The Mercer station, scheduled for initial operation in July, 1958, will have an ultimate capacity of 180 megowatts, comprising 6 units of 30 megowatts. Boilers will be pulverised coal-fired with steam conditions 635 p.s.i., 865° F.

The Wairakei Geothermal power station is scheduled for initial operation in July, 1958. The initial capacity of 69 megowatts will consist of a number of H.P., I.P. and L.P. sets, the working pressures being H.P. 180-50 p.s.i., I.P. 50-0.5 p.s.i., and L.P. 0.5 p.s.i./to vacuum. Steam is piped from wells, and there are no boilers.

Applicants should have had considerable experience in the operation, maintenance and administration of a modern steam power station and possess recognised qualifications for such duties.

Appointees will be required to reside at the nearby Departmental power station village. Married accommodation available.

Forms of application, together with further particulars and information, may be obtained from the Office of the High Commissioner for New Zealand, 415, Strand, London, W.C.2, quoting reference 3/42/16. 1245

EAST MIDLANDS ELECTRICITY BOARD

Third Assistant District Commercial Engineer, Derby District

APPLICATIONS are invited for the appointment of a THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER in the Derby District of the Derby and Burton Sub-Area.

The salary and conditions for the post will be in accordance with the National Joint Board Agreement, Class G, Grade 9 (£835 × £15 to £880 per annum).

Applicants should have a sound technical and workshop training, a thorough knowledge of tariffs and the I.E.E. regulations, and should hold the Higher National Certificate in Electrical Engineering.

They must have experience in the preparation of specifications and estimates for all classes of electrical contracting and the changeover of consumers' appliances to standard voltage ; the organisation, control, supervision, and testing of installation work, and the maintenance of agricultural, commercial, domestic and small industrial apparatus and equipment.

The successful candidate will be required to live in or near Derby, and ability to drive a motor vehicle would be an advantage.

Applications, giving details of age, qualifications, experience, previous and present appointments, should be forwarded to the Manager, Derby and Burton Sub-Area, 35, Full Street, Derby, so as to reach him within fourteen days of the date of this advertisement. 1244

TRANSFORMERS AND POWER CAPACITORS

YOUNG ENGINEERS required for Sales and Contracts office. Applicants should be desirous of adopting a technical sales career and be prepared to extend their technical education to Higher National standard.

Apply—

Sales Manager
BRYCE ELECTRIC CONSTRUCTION CO. LTD.
Kelvin Works, Hackbridge, Surrey 1039

NORTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT ENGINEER,
KEARSLEY DISTRICT.

Duties will include the operation, maintenance and construction of underground and overhead mains, substations and transformers, and general mains work, including standby duty. Applicants should state their experience in high-voltage mains work.

Applicants should hold the H.N.C. in Electrical Engineering, and Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary scale £995 × £20 to £1,055 p.a., Grade H.7. N.J.B. conditions.

Applications, naming three referees, to Sub-Area Manager, No. 2 Sub-Area, North Western Electricity Board, 2, St. George's Road, Bolton, by 23rd November, 1957.

Previous applicants for this post need not re-apply as their applications will be reconsidered.

DEMONSTRATOR,
SOUTH LAKELAND DISTRICT
(Barrow).

Applicants should be experienced in public demonstrations of electrical appliances and be competent to plan and give cookery demonstrations and lectures, and advise consumers on the utilisation of electrical appliances. They should have had a domestic science training and preferably hold the E.A.W. Electrical Housecraft Certificate.

Salary scale £500 × £20 to £600 p.a. (progress beyond £540 subject to certificate of capability). Grade 1. N.J.C. conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, North Western Electricity Board, Castle Green, Kendal, by 23rd November, 1957. 1229

CENTRAL ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following posts at Divisional Headquarters, Cockfosters, adjacent to Cockfosters Station (Piccadilly Line) :—

SENIOR DRAUGHTSMEN
(Electrical).

Salary Schedule D, Grade 4, £945-£1,045 per annum (including London weighting). The commencing salary will depend upon experience and qualifications.

Applicants should preferably have experience in the layout of generating station auxiliaries, including H.V. switchgear, transformers, lighting and cabling.

New offices recently completed in pleasant surroundings, excellent working conditions. Canteen available. Sports and social club, sick pay and superannuation schemes. Generous holidays.

Applications, quoting reference No. 2/8574, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Authority, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts, to arrive by 23rd November, 1957.

W. N. C. CLINCH,
Controller. 1168

EASTERN ELECTRICITY BOARD

Chief Engineer
143/57.R.

APPLICATIONS are invited for the above-mentioned appointment at Board Headquarters, Wherstead, Ipswich, in succession to Mr. G. N. Green who has been appointed as Deputy Chairman of the North Eastern Electricity Board. Candidates must be Chartered Electrical Engineers.

The post is one carrying wide responsibilities in a Board with electricity distribution duties in an area of approximately 8,000 square miles and with a large development programme involving extensive capital construction work.

The appointment is superannuable and the salary will be within the range £3,500-£4,250; the commencing salary will depend upon qualifications and experience.

Applications by letter should be submitted to the Secretary, Eastern Electricity Board, P.O. Box 40, Wherstead, Ipswich, Suffolk, by 1st December, 1957. 1285

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Essex Sub-Area, Southend District

THIRD ASSISTANT ENGINEER
(140/57.R.).

Candidates should have had a sound technical training and suitable experience in the planning, construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.

Salary N.J.B. Class G, Grade 9 (£835-£880).

Apply by letter, within 14 days, to the District Manager, Eastern Electricity Board, 85, London Road, Southend-on-Sea, Essex.

Fens Sub-Area

FOURTH ASSISTANT ENGINEER
(Construction)
(141/57.R.).

Applications are invited from candidates who have had a sound technical training for the position of Fourth Assistant Engineer in the Construction Department based on St. Neots.

The position is one involving day to day supervision of construction of indoor and outdoor 33-kV and 11-kV substations throughout the sub-area, and offers a good opportunity for gaining wide experience in this field.

Salary N.J.B. Class J, Grade 12 (£790-£835).

Apply by letter, within 14 days, to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambs.

Chilterns Sub-Area, Luton District

SENIOR DEMONSTRATOR
(142/57.R.).

Candidates should hold the E.A.W. Certificate and Diploma. Experience in the organisation of public demonstrations and lecturing on domestic electrical subjects, together with proved sales ability preferably with direct experience in the sale of all types of domestic apparatus, is essential.

Salary N.J.C. Grade 2 (£615-£675).

Apply by letter, within 14 days, to the Manager, Luton District, Eastern Electricity Board, 487, Dunstable Road, Luton, Beds. 1286

SOUTH OF SCOTLAND ELECTRICITY BOARD

Edinburgh and Borders Area

Appointment of First Assistant District Engineer (Edinburgh East District)

APPLICATIONS are invited for the position of FIRST ASSISTANT DISTRICT ENGINEER, Edinburgh East District.

Applicants of Graduate Standard I.E.E., should have experience in the planning, construction, operation and maintenance of a large city network at voltages up to and including 33 kV.

Salary N.J.B. Schedule A, Class F, Grade 4, £1,065-£1,140 per annum. The post is superannuable, subject to satisfactory evidence of health.

The successful candidate will require to reside within a reasonable distance of District Headquarters.

Application on the standard form, obtainable from the undersigned or any other Area Manager, should be submitted not later than Saturday, 30th November, 1957.

C. H. A. COLLYNS,
52, Melville Street, Manager.
Edinburgh, 3.
8th November, 1957. 1298

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

THIRD ASSISTANT COMMERCIAL ENGINEER required in the No. 3 Sub-Area Commercial Department at Chester.

Salary within range £935/£995 per annum (N.J.B. K/10).

Applicants should have had experience of rural, urban and industrial development in the electricity supply industry, and be in possession of appropriate technical qualifications.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 3 Sub-Area, Electricity House, Newgate Street, Chester. Closing date 29th November, 1957. 1293

DEPARTMENT OF HEALTH FOR SCOTLAND

X-Ray Engineering Unit

Technical Officer Grade II (Engineering Assistant)

THE CIVIL SERVICE COMMISSIONERS invite applications from men for three pensionable posts. Headquarters in Edinburgh and Glasgow, but travelling involved. Duties include the preparation of wiring diagrams and installation supervision in connection with X-ray, electro-medical and sterilising equipment supplied to hospitals. Periodic visits of inspection are also made.

Age at least 25 on 1st October, 1957.

Candidates must have served a 5-year apprenticeship (or its equivalent) with an engineering concern giving a good comprehensive training. They must have had experience in the design, manufacture, installation and testing of X-ray and electro-medical apparatus. Possession of a National Certificate in Electrical Technology or a comparable qualification is desirable and membership of the Society of X-ray Technology an advantage.

Exceptionally, in lieu of the foregoing qualifications, evidence of lengthy experience in the X-ray and electro-medical industry and of very high technical attainment may be accepted.

Starting salary £720 (at 25) up to £845 (at 30 or over). Maximum £1,000. Exceptionally, starting salary above minimum may be granted.

Further particulars and application forms from Establishment Officer, Department of Health for Scotland (Room 30), St. Andrew's House, Edinburgh, 1.

Completed application forms should be returned by 9th December, 1957. 1272

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Maintenance and Operation)

Isle of Wight District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class E, Grade 10 (£685 × £15 to £730 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution, mains and substations, and with minor construction work. The possession of suitable technical qualifications will be an advantage. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not later than 25th November, 1957.

Assistant Engineer (Local)

Swindon District of No. 2 (Newbury) Sub-Area, located at Cirencester. Salary N.J.B. Class F, Grade 11 (£685 × £15 to £730 per annum). N.J.B. conditions of service.

Applicants should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and distribution equipment, and possess suitable technical qualifications. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, and returned to him in envelopes suitably endorsed, not later than 25th November, 1957.

The successful candidates for the above appointments will be required to contribute to the Central Electricity Authority and Area Boards' (Staff) superannuation scheme, if eligible. 1295

ELECTRICAL ENGINEER

required at

THE ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL,

to run the electrical workshop, installation, maintenance and test department, dealing with a wide range of industrial and scientific equipment.

Corporate Membership of I.E.E. or equivalent standard.

Salary £815 (at 25) to £1,270 (Engineer III) or exceptionally £1,300-£1,740 (Engineer II).

Housing, superannuation and excellent conditions.

Send POSTCARD for application form and details to Recruitment Officer (953Y/48), A.E.R.E., Didcot, Berks. 1212

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Worcester and District Sub-Area

DISTRICT COMMERCIAL ENGINEER
(Redditch/Bromsgrove District).

Candidates should have technical and personal qualifications of a high standard and a good record of progressive activity and organising ability in district commercial work. Direct experience of contracting, consumers' service, showrooms, sales development and departmental administration is desirable. Salary £1,065/£1,140 per annum (N.J.B. Grade F.4).

Apply by letter, within fourteen days, stating age, qualifications, experience, present position and salary to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

North Staffordshire Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER
(Congleton District).

Applicants will be required to assist in all branches of distribution work, including construction, operation and maintenance of HV/LV overhead and underground mains and substations. Technical qualifications desirable. Salary £590/£635 per annum (N.J.B. Grade D.11).

Apply by letter, within fourteen days, stating age, experience, present position and salary to Mr. H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

A. STEPHENS,
Secretary.
1284

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the position of SECOND ASSISTANT ENGINEER (Mechanical) in the Development Section of the Chief Commercial Officer's Department at Board Headquarters.

The successful candidate will be engaged on the work of advising industrial consumers of electricity and developing industrial electrical load.

Applicants should have a sound technical training, a Higher National Certificate in Mechanical Engineering, or its equivalent, and experience in the following fields is desirable:—

- Design or construction of machinery and control equipment for production line or process work.
- Modern machine shop practice.
- Steam engineering and hydraulics.
- Work study methods.

Salary N.J.B. Schedule B, Class AX/DX, Grade 4, £1,145/£1,375 per annum. The position is superannuable.

Applications should be made on the standard form, which may be obtained from the undersigned, and should be returned not later than Monday, 25th November, 1957. Please quote Reference No. C7/57.

ANDREW A. WALLACE,
Secretary.
P.O. Box 173,
351, Sauchiehall Street,
Glasgow, C.2.
28th October, 1957. 1300

HARRIS COLLEGE OF FURTHER EDUCATION, PRESTON

Principal:
H. Wilkinson, M.Sc.Tech., Ph.D., A.Inst.P.

APPLICATIONS are invited for the appointment of ASSISTANT LECTURER GRADE B in ELECTRICAL ENGINEERING, to commence on 1st January, 1958, or as soon after as possible. Candidates should possess a degree or equivalent qualification, with teaching and/or industrial experience, and will be expected to teach up to Higher National Certificate level.

Salary within the range £650-£1,025 according to qualifications and experience, with additions for graduateship and training.

Further particulars and form of application can be obtained from the Principal, Harris College, Corporation Street, Preston, to whom they should be returned within 14 days of the appearance of this advertisement.

W. R. TUSON,
Clerk to the Harris Council.
Municipal Building,
Preston. 1264

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the position of FOURTH ASSISTANT ENGINEER in the Development Section of the Chief Commercial Officer's Department at Board Headquarters.

The successful candidate will be engaged on the work of advising industrial consumers of electricity and developing industrial electrical load.

Applicants should have a sound technical training, a Higher National Certificate in Electrical Engineering or its equivalent and some experience of the utilisation of electricity in industrial establishments. Experience in electrical load development or of selling industrial electrical equipment would be advantageous.

Salary N.J.B. Schedule B, Class AX/DX, Grade 7, £810/£1,010 per annum. The position is superannuable.

Applications should be made on the standard form which may be obtained from the undersigned, and should be returned not later than Monday, 25th November, 1957. Please quote Reference No. C9/57.

ANDREW A. WALLACE,
Secretary.
P.O. Box 173,
351, Sauchiehall Street,
Glasgow, C.2.
28th October, 1957. 1301

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the position of FOURTH ASSISTANT ENGINEER in the Development Section of the Chief Commercial Officer's Department at Board Headquarters.

Duties will include the design of electrical space heating schemes, including floor warming, electrode boilers and block storage heaters.

A sound technical training in mechanical and electrical engineering and some experience in the preparation of estimates, specifications and drawings for central heating plants is required. Qualifications leading to membership of the Institution of Electrical Engineers and/or the Institution of Heating and Ventilating Engineers are desirable.

Salary N.J.B. Schedule B, Class AX/DX, Grade 7, £810/£1,010 per annum. The position is superannuable.

Applications should be made on the standard form which may be obtained from the undersigned, and should be returned not later than Monday, 25th November, 1957. Please quote Reference No. C8/57.

ANDREW A. WALLACE,
Secretary.
P.O. Box 173,
351, Sauchiehall Street,
Glasgow, C.2.
28th October, 1957. 1299

AN EXPERIENCED MANAGER

is required by well-established firm of ELECTRICAL WHOLESALERS for their BIRMINGHAM branch.

The appointment carries a good salary and prospects.

A company car is provided and a pension scheme is in operation.

Apply, in confidence, with full details of career, to the Managing Director.

Box 1214

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

ESTIMATOR for TECHNICAL SALES. Correspondence and capable of preparing control schemes involving automatic motor control gear. Experience essential.

CIRCUIT DIAGRAM DRAUGHTSMAN. Preferably experienced in preparing automatic control gear schemes.

Applicants to have O.N.C. (Electrical). Excellent opportunities with fast growing concern. Pension scheme. Apply to Managing Director, stating experience and present salary. 165

Situations Vacant *(continued)*

ELECTRICAL ENGINEERS AND DRAUGHTSMEN

required by progressive firm near Glasgow, manufacturing switchgear and control gear for medium-voltage A.C. systems in power stations, steel works, collieries, oil refineries and chemical works.

ELECTRICAL ENGINEERS: Two required, experienced in preparing specifications for substantial contracts and in developing schemes of control providing indication, interlocking and sequence as required. Graduate Engineers or men holding H.N.C. preferred; others having good practical experience and prepared to study to H.N.C. standard will receive serious consideration.

DRAUGHTSMEN: Two required, experienced in layout, design and preparation of manufacturing drawings and specifications. Men holding O.N.C. preferred; juniors with two years' drawing office experience and studying for O.N.C. also considered.

Unusual opportunities for advancement for capable men. Salary dependent on past experience and technical qualifications. Excellent working conditions. Five-day week. Canteen. Contributory pension scheme, providing free life insurance.

Applicants should state qualifications, practical experience and salary desired.—Box 1249.

LONDON ELECTRICITY BOARD

Assistant Secretary

(Revised Advertisement)

APPLICATIONS are invited for the appointment of an ASSISTANT SECRETARY at the Board's Headquarters in Central London.

Candidates should have wide experience of secretarial and administrative work in the electricity supply industry. The duties of the post will include secretarial service to the Board and its committees, the preparation of reports and responsibility for matters of general administration.

The post has been allocated to Grade 6, Class C, under the recent agreement of the National Joint Managerial and Higher Executive Grades Committee, the salary being within the range £2,160/£2,360 per annum, inclusive of London Area allowance.

Applications, stating age, qualifications, experience, present position and salary, should be forwarded to the Secretary, London Electricity Board, 46, New Broad Street, London, E.C.2, so as to be received by 28th November, 1957. 1250

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

FOURTH ASSISTANT ENGINEER is required in the System Development Section of the Technical Department at Headquarters, Moseley, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 7, commencing at a point commensurate with qualifications and experience within the range £810-£935 per annum, ultimately rising to £1,035 per annum.

Applicants should have had experience either in the supply industry or with a switchgear manufacturer, and a knowledge of the calculations involved in the development and operation of power systems will be an advantage. Technical qualifications up to Graduate I.E.E. standard are desirable.

Apply, quoting the vacancy number 678MD, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 3rd December, 1957. 1240

CENTRAL ELECTRICITY AUTHORITY

South Western Division

ASSISTANT SHIFT CHARGE ENGINEER required at Hayle Power Station.

Superannuation scheme. Salary N.J.B. Class F, Grade 9, £790-£835 plus 10% for shift duties.

Applicants should have had sound technical training and practical experience in a modern power station.

Applications on form A.E.6/ACT obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 22nd November, 1957. 1283

CENTRAL ELECTRICITY AUTHORITY

North West, Merseyside and North Wales Division

RESIDENT PLANT ENGINEER required to supervise all plant erection at 1,000-MW thermal power station under construction at High Marnham, Notts. The appointment is a temporary one expected to continue until late 1962. Salary £1,560 rising to £1,825 per annum.

Applicants should preferably possess an engineering degree, Higher National Certificate or equivalent qualification in mechanical engineering. Practical experience of modern power station construction (particularly site organisation) is essential.

Application forms, available from Director of Labour and Welfare, Central Electricity House, 825, Wilmslow Road, Manchester, 20, should be returned to that address not later than 23rd November, 1957. Please quote Vacancy No. E.43/444/R. 1241

ENGINEERS FOR THE DEVELOPMENT OF RAILWAY SIGNALLING APPARATUS

SEVERAL ENGINEERS are required for work on signals, track apparatus, relays, relay racks, control panels, remote control systems, automatic train control, automatic control of marshalling yards, etc. Previous experience of this type of work is not essential, but for some of the positions a knowledge of electronics will be an advantage.

The minimum technical qualification required is the Higher National Certificate (or equivalent).

These positions are pensionable and based on Trafford Park.

Write for application form, quoting reference "C.10," to:—

The Personnel Manager
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.
Trafford Park, Manchester, 17 1248

KENT EDUCATION COMMITTEE

North-West Kent College of Technology

Electrical Engineering Department

LECTURER in Light Current Electrical Engineering required to teach H.N.C. and Radio and Television Servicing subjects. The person appointed will be responsible for a well-equipped radio and measurements laboratory and the equipment of a new laboratory for radio and television servicing.

Salary will be in accordance with the Burnham Technical Report, 1956, on the £1,200-£1,350 scale.

Forms of application, together with further particulars, may be obtained from the Principal at the College, Miskin Road, Dartford, Kent. 1210

BRITISH THOMSON-HOUSTON CO. LTD.

THE BRITISH THOMSON-HOUSTON Co. Ltd. has vacancies in its RESEARCH LABORATORY at RUGBY for ELECTRICAL ENGINEERS to join a group engaged in the development of improved insulating materials and processes for electrical machines. The work covers a wide and interesting field and includes the study of material properties, high-voltage phenomena, and the devising of realistic methods of assessing new insulation.

Applicants, who should have a degree or Higher National Certificate in Electrical Engineering and be free from National Service obligations, are invited to write to the Director of Research, The British Thomson-Houston Co. Ltd., Rugby, stating age, qualifications and experience, quoting reference SR. 1247

VERITYS LIMITED

Plume Works, Aston, Birmingham, 6

SWITCHGEAR DESIGNER wanted. Sound technical knowledge and experience of development work is desirable.

Assistance in the obtaining of a house will be given if required, and moving expenses paid. Superannuation scheme available.

Reply in first instance by letter giving full details of qualifications and experience to Head of Research and Development. 124

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

THIRD ASSISTANT COMMERCIAL ENGINEER required at the Board's No. 4 Sub-Area Headquarters, Rhostyllen, near Wrexham. Salary within range £935/£995 per annum (N.J.B. K/10).

Applicants should have received a sound engineering training, with some specialisation in the design of lighting installations, including street lighting, floodlighting and installations for both commercial and industrial premises.

The duties will include negotiations with lighting authorities, attendance at Council meetings, planning trunk road lighting installations, and generally acting in a consultative capacity to lighting authorities.

Ability to give demonstrations and talks on lighting would be an advantage.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager at the above address. Closing date 27th November, 1957. 1294

INTERNATIONALLY FAMOUS ELECTRIC SHAVER COMPANY

is seeking a

SALES EXECUTIVE

to take over existing sales and undertake promotion of expansion policy based on new Servicing and Sales Centre in West End of London. Remuneration will depend on applicant's ability and experience.

Opportunity to fill a more senior appointment which will become available shortly will also be given to successful candidate.

Please write giving full particulars, marking envelope "Strictly Confidential," to Managing Director, F. & G. Turnpenny Ltd., 5, Great Winchester Street, London, E.C.2.

1288

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

ENGINEERING DRAUGHTSMAN (Junior) required in the Transmission Department, Moseley, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule D, Grade 6, £595-£715 per annum.

Applicants should have had a good general and technical education, and experience in the preparation of layout plans, electrical diagrams, and engineering drawings, preferably associated with high-voltage substations and for overhead transmission lines.

Apply, quoting Vacancy No. 677, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 26th November, 1957. 1262

NATIONAL COAL BOARD

ELECTRICAL ENGINEER required by N.C.B.'s Production Dept. (Collieries Branch) in London to advise on problems associated with electric motors and transformers and to assist in the general electrical work of the branch. Experience in the design, manufacture and application of electric motors, transformers and capacitors is required.

Appointment (superannuable) according to qualifications and experience within inclusive range £1,350-£1,964.

Write for application form to National Coal Board, Staff Dept. (X.565/3E), Hobart House, London, S.W.1, before 22nd November, 1957. 1228

MIDDLESEX COUNTY COUNCIL

ELECTRICAL ENGINEERING ASSISTANT required in County Architect's Department for preparation of plans and specifications for wiring of buildings.

A.P.T. II, salary £696 to £845 p.a. plus London weighting (26 and over £30 p.a.; 21-26 £20 p.a.). 5-day week. Established, pensionable. Prescribed conditions.

Application forms (stamped addressed foolscap envelope) from County Architect, 1, Queen Anne's Gate Buildings, Dartmouth Street, London, S.W.1, returnable by 23rd November (quote W.382 ER). Canvassing disqualifies. 1211

CENTRAL ELECTRICITY AUTHORITY

Yorkshire Division

APPLICATIONS are invited for the appointment of POWER STATION SUPERINTENDENT at Skelton Grange Power Station, Leeds (station capacity 360 MV).

Salary £1,900-£2,100 per annum, Class C, Grade 5, N.J.M. and H.E. Grades Agreement.

Applicants should have had wide experience in the operation and maintenance of large modern power station plant, including pulverised fuel fired boilers, and have held a position of responsibility involving the control of staff.

Candidates should preferably be Corporate Members of the Institution of Electrical Engineers and/or Institution of Mechanical Engineers or should hold equivalent qualifications.

Application forms obtainable from the Divisional Secretary (Establishments), Central Electricity House, St. Mary's Road, Leeds, 7, to be returned within 14 days of the appearance of this advertisement. 1274

EAST MIDLANDS ELECTRICITY BOARD

Fourth Assistant Engineer (Shift Operation), Northamptonshire Sub-Area

APPLICATIONS are invited from suitably qualified and experienced engineers for the position of FOURTH ASSISTANT ENGINEER (Shift Operation) on a two-shift rota at the Sub-Area Headquarters, Northampton.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement, Class K, Grade 12 (£835 × £15 to £880 per annum, plus 10% shift allowance).

Experience of operation duties on a distribution system or in a generating station would be an advantage.

Applications, stating age and details of education, qualifications, experience, present position and salary, should be forwarded to the Manager, Northamptonshire Sub-Area, 25, Bridge Street, Northampton, to reach him within fourteen days of the issue of this advertisement. 1243

Applications are invited by

THE BENJAMIN ELECTRIC LTD.

for a

DESIGNER OF INDUSTRIAL LIGHTING EQUIPMENT.

Knowledge of fabricating techniques, finishes, lamps and control gear desirable, but initiative and ideas equally important.

Apply Chief Technical Engineer, Brantwood Works, Tottenham, London, N.17.

177

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Lochaber Area

APPLICATIONS are invited for the post of CHARGEHAND ELECTRICIAN. Experience in the operation and maintenance of high-voltage substations would be an advantage. Terms of employment in accordance with National Joint Industrial Council for Electricity Supply Industry. Present rate 4s. 10½d. per hour.

Application forms obtainable from Area Manager, Area Office, Bank St., Fort William. To be returned not later than Thursday, 28th November, 1957. 1263

CENTRAL ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 171/ER/57

APPLICATIONS are invited for superannuable N.J.B. appointment of STATION SHIFT CONTROL ENGINEER, UPPER BOAT POWER STATION.

Salary H.10, £835-£880 per annum.

H.N.C. or equivalent qualifications desirable.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 26th November, 1957. 1273

ELECTRONIC CONTROL AND MEASUREMENT

ELECTRICAL ENGINEERS and DRAUGHTSMEN required to design ELECTRO-MECHANICAL UNITS including 1-h.p. inductor alternators and associated circuits. Degree or H.N.C., with three years' responsible experience, is essential.

SENIOR TRIALS ENGINEER to carry out field trials on above in conjunction with R.A.E. Some experience in airborne telemetry an advantage.

Also required: JUNIOR ENGINEERS, DRAUGHTSMEN, PROTOTYPE COIL WINDER, TECHNICAL ASSISTANTS.

Apply, quoting LY.20 :—

Special Products Division
J. LANGHAM THOMPSON LTD.
Dalston Gardens, Stanmore, Middx.
(Tel. Wordsworth 8861) 1215

CENTRAL ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following position:—

STATION CHEMIST, SWINDON GENERATING STATION (S/13.967).

Applicants should have had practical experience of fuel, water and oil testing appropriate to a modern generating station, and must have a knowledge of boiler chemistry for high steam pressures and temperatures. Applicants should possess at least H.N.C. in Chemistry or hold equivalent qualifications.

Salary N.J.B. Grade E/7, £835-£880.

Special application forms for the above post obtainable from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 27th November, 1957. 1319

WOLVERHAMPTON & STAFFORDSHIRE COLLEGE OF TECHNOLOGY

APPLICATIONS invited for post of LECTURER in DEPARTMENT OF ELECTRICAL ENGINEERING.

Candidates must have a degree in electrical engineering with suitable industrial and/or teaching experience and be capable of teaching heavy current electrical engineering and servo-mechanisms to Higher National Certificate and degree standard.

Salary Burnham technical scale, £1,200 to £1,350. Post available 1st May, 1958.

Application forms and further particulars from undersigned (s.a.e.).

G. W. R. LINES,
Clerk to the Governors.

Education Offices,
North Street,
Wolverhampton. 1303

GLOUCESTER TECHNICAL COLLEGE

APPLICATIONS are invited for the post of LECTURER IN ELECTRICAL ENGINEERING. Candidates must possess a degree in engineering and will be required to teach electrical and other subjects suitable to their qualifications (preferably including Mathematics) up to Higher National Certificate and Part III I.E.E. standard.

Previous teaching and/or suitable industrial experience preferred.

Salary £1,200 by £30 to £1,350 p.a.

Application form (stamped addressed envelope) from the Principal, Gloucester Technical College, Brunswick Road, Gloucester, to be returned within 10 days of the appearance of this advertisement. 1246

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

TECHNICAL SALES ENGINEERS required for London and Home Counties. Knowledge of motor control gear; sales experience preferred but not essential. Apply giving full particulars to—Managing Director. 166

ROCHDALE EDUCATION COMMITTEE

ASSISTANT GRADE B to teach Electrical Engineering to O.N.C. and C. and G. Electrical Technicians' courses.

Forms obtainable from the Chief Education Officer, Education Office, Fleece Street, Rochdale, returnable by 29th November. 1227

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

ASSISTANT ENGINEER (Operation and Efficiency) is required for Ironbridge Power Station, Buildwas, Salop. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade H8, £935-£995 per annum.

Applicants should have received a sound technical and practical training, and should have considerable experience in the operation and maintenance problems arising in a modern power station. The possession of a recognised technical qualification will be an advantage.

Apply, quoting Vacancy No. 682MD on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 28th November, 1957. 1280

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

FOURTH ASSISTANT ENGINEER is required in the Metering Section of the Technical Department. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 8, commencing in range £710 × £25 to £835 and ultimately rising to £935 per annum.

Applicants should possess Higher National Certificate or equivalent qualification in electrical engineering and have a good knowledge of electrical measurements and preferably have experience in bulk supply metering equipment.

Apply, quoting Vacancy Number 681MD on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 28th November, 1957. 1281

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

ASSISTANT ENGINEER (Works Office) is required at Nechells "B" Power Station, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade J.10, £885-£930 per annum.

Applicants should have some knowledge of power station electrical and mechanical maintenance, and the successful candidate will be responsible for planning and progress work involving station statistics and plant records. Appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy Number 679MD on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 30th November, 1957. 1282

ELECTRIC MOTOR DESIGNERS

A.C. and D.C. DESIGNERS required by firm manufacturing motors, fractional to 500 b.h.p.

Replies in confidence, stating age, experience and salary expected, to :—

LAURIE & CO.
Employment Specialists
19, Basinghall Street, London, E.C.2

9198

WARD & GOLDSTONE LIMITED

require a

REPRESENTATIVE

to call on all manufacturers using their products in the London area. Salary, commission and expenses paid. Car provided. Applicants must have their own personal connections at top levels and must be fully conversant with the products they will be expected to sell.

Apply giving full details of experience, references, etc., to Mr. A. G. Jackson, Director, Ward & Goldstone Limited, 5, Percy Street, Tottenham Court Road, London, W.1. 1316

BOOK-KEEPER (male), experienced, capable of taking charge of accounts and ledgers for expanding branch; good opportunity for young, keen and accurate worker. Write stating age, experience and salary required.—Berkeley Elec. Eng. Co. Ltd., Vincent House, Vincent Square, London, S.W.1. 1219

***Situations Vacant** (continued)*

A CABLE works in North London has a vacancy for a male chemist. The work involves supervision of factory processes and laboratory investigation of production problems and new products. Applicants should be of Higher National Certificate or equivalent level of education and have completed military service. Replies giving age, qualifications and experience should be addressed to—Box ER.701, c/o 191, Gresham House, London, E.C.2.

A.C. motor designer required with experience on the design of totally enclosed machines up to 3,300 volts. Must be conversant with automatic control gear. Knowledge of flameproof enclosures an advantage, but not essential. State age, qualifications and experience, to Personnel Manager, Mavor & Coulson, Ltd., 47, Redan Street, Bridgeton, Glasgow, S.E. 1291

A JUNIOR estimating engineer is required in the Manchester sales office of a well-known electric switch and control gear manufacturer. Give full particulars to—Box 9196.

AN engineer or physicist is required by the L.S.B. to specialise in lighting development. Applicants should be of good education, preferably with qualifications acceptable to the major institutions, but imaginative thought, a good presence, and ability to speak in public are essential. The position is one with scope and interest. Apply to—The Manager, The Lighting Service Bureau, 2, Savoy Hill, London, W.C.2. 1216

AN engineer representative required for the London area for the sale of switchgear, fuse distribution gear and accessories. Applicants should have sound electrical knowledge and sales experience. A connection amongst users, contractors and wholesalers in the area is desirable. Full details of experience, salary required, etc., to—Wm. Sanders & Co. (Wednesbury) Ltd., Wednesbury, Staffs. 1217

APPLICATIONS are invited for the position of senior transformer designer with a company in the North. Applicants should have experience in all aspects of design of transformers up to and including 20/30 MVA. Approximate salary £1,700 per annum for the position, which is permanent and progressive. Assistance will be given towards re-housing expenses. Apply, stating age and experience, to—Box 1218.

ASSISTANT to chief engineer required by well-known accessory manufacturers situated in pleasant north country district. A wide scope exists covering general research and development work, both in respect of the company's existing and new products envisaged. Designing ability at the drawing board stage is important, and laboratory experience together with a knowledge of electronics would be an advantage. Pension scheme. Apply in confidence stating full details and salary required, to—Box 1304.

ASSISTANT to managing director required by small manufacturing company. Minimum qualification O.N.C. Experience of small motors and control gear including inspection desirable. The post offers great opportunity to young man with drive and initiative. Write detailing qualifications, training, experience and salary required to—Poxon Engineering Ltd., 1, Northolt Road, Harrow. 9190

BUYER required by firm of electrical and mechanical engineers. Full particulars, including age, experience and salary required, to—Browning's Electric Co. Ltd., Boleyn Castle, Green Street, Upton Park, London, E.13. 1158

CABLE jointers and mates required for employment in the London area. Must be good plumbers and experienced in voltages up to 11 kV, also live L.V. work.—Box 1173.

CHIEF electrical designer required for small and medium A.C. and D.C. machines. Apply, in confidence, giving details of age, experience and salary required to the Secretary, Bull Motors, Foxhall Works, Ipswich. 1231

CIRCUIT design draughtsmen required by company manufacturing industrial control equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works. Inverness Road, Hounslow, Middx. 273

CONTRACTS engineer required for the installation and jointing of power cables, control of rough labour, and keeping as laid drawings on contracts in London and elsewhere. Must be prepared to travel. Good salary and conditions. Permanent employment.—Box 1134.

C. MAURICE CONTRACTORS Ltd., civil and electrical engineers, require electrical engineer with experience of large cable laying, jointing and substation construction contracts for supervisory work. Apply in writing to General Manager, Lindsey Road, Bishop's Stortford, Herts. 1307

DESIGNER draughtsman, leading firm of contractors London, has a senior appointment of wide scope and interest available to a first-class engineer able to design (and supervise site work) high-class electrical installations of all types. Good junior also required. Excellent prospects and salary. Write, experience, age and salary envisaged.—Box 1203.

DEWHURST & PARTNER Ltd. require technical estimator for preparing tenders in their estimating engineering department. Applicant must have good electrical engineering background and have basic knowledge of motor control equipment and its applications. The position is a senior one, and housing assistance will be given to successful applicant if necessary. Canteen facilities, pension scheme. Write giving age, experience, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middlesex. 274

DRAUGHTSMEN (senior) required, preferably with experience in the design of fractional to 10-h.p. electric motors. Varied and interesting work. Staff pension scheme. Please apply giving particulars of previous experience, to—Personnel Manager, Small Electric Motors Ltd., Churchfields Rd., Beckenham, Kent. 1287

ELECTRIC shaver repair. Mechanic required for West End of London repair and servicing centre of Swiss manufacturer. Free training will be given to successful candidate at factory in Switzerland. 5-day week. Hours 9 a.m. to 5 p.m. Free luncheon vouchers. Good pay and prospects of promotion for conscientious and competent man. Full particulars, in confidence, to—Secretary, F. & G. Turnpenny Ltd., 5, Great Winchester Street, London, E.C.2. 1289

ELECTRICAL contractors, London area, require experienced supervising engineer. —Box 1220.

ELECTRICAL engineer assistants required, preferably with H.N.C. and experience in the design and layout of M.V. and H.V. distribution. Write giving particulars of age, qualifications, experience and present employment to—Rendel, Palmer & Tritton, Consulting Engineers, 125, Victoria Street, London, S.W.1. 1221

ELECTRICAL engineer required for S.W. London office of consulting engineers. Must be experienced in industrial installations and/or chemical plants. Applicants must be capable of supervising projects through all stages and should hold a degree or equivalent in electrical engineering. Salary not less than £1,200 p.a. Minimum age 30.—Box 1308.

ELECTRICAL engineer, young, qualified, required as assistant to works electrical engineer cement industry. Progressive post giving opportunity to gain experience of large installation. House with garage available. Write with full details to—Box Z.322, c/o Streets, 110, Old Broad Street, London, E.C.2. 1222

ELECTRICAL fitters and fitters' mates, experienced in erection of all types of metal-clad L.V. and H.V. switchgear up to and including 11 kV, and outdoor gear up to and including 33 kV, together with the essential secondary wiring and cabling; required for contract work in South-East England.—Box 1252.

ELECTRICAL wholesalers have vacancies for sales assistants with intimate knowledge of electrical trade. Very good commencing salary and L.V.'s.—Phone, BIS. 4356 (London). 1305

ELECTRICIAN (assistant foreman) required for factory S.W. London. Aged about 35 and who has had considerable experience in the electrical services of a large factory. The successful applicant would be required to supervise the maintenance of electric motors, wiring, the installation of new work, etc., and should be experienced in the operation of 500-kW alternators. An O.N.C. in electrical engineering would be an advantage. This position will quickly lead to that of foreman. Write stating age, experience and salary required to—Box 1232.

ENGINEER required for interesting development and experimental work in connection with electrical fire protection. Good future prospects. North London district. Salary £750/£800 p.a.—Box 1306.

ELECTRICIAN-fitters with experience in armoured cables, A.C. motors and industrial switchgear work, willing to travel London area. Write stating age and experience.—E.M.F. Ltd., 72, Farm Lane, Fulham, London, S.W.6. 1276

ELECTRO-mechanical draughtsmen required for production drawing office of company engaged in the manufacture of control gear equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 275

ELECTRONIC draughtsman required for work associated with the manufacture of electronic equipment for use in geophysical oil exploration. Applicants must have good knowledge of electronic components and experience of layout work on small assemblies. Five-day week in ideal surroundings near Bromley, Kent. —Box 1309.

ENGINEERS, assistant engineers and technical assistants required for electrical, mechanical and commercial engineering associated with the planning and execution of railway signalling projects in the U.K. and British Commonwealth. Excellent prospects for those interested in light current engineering, electronic and relay circuiting, and analysis of railway operating problems from technical or commercial aspects. The positions are pensionable after satisfactory probationary period. Location London or Manchester. Salary according to age, qualifications and experience. Applicants should state their age, educational qualifications and technical experience. Applications should be sent to the Manager, Metropolitan-Vickers G.R.S. Limited, 132/135, Long Acre, London, W.C.2. 1174

ESTABLISHED firm of electrical and mechanical engineers in Bolton require draughtsmen, designer-draughtsmen and testers in their recently formed transformer department. The positions offer considerable scope for advancement. Superannuation scheme in existence. Write giving details of salary required to—Box 9199.

EXPERIENCED draughtsman required for interesting contract work. Electrical knowledge essential. Good conditions and prospects. Pensionable staff appointment. Please apply in writing to Personnel Manager, Ferguson Pailin Ltd., Higher Openshaw, Manchester, 11. 1175

EXPERIENCED engineer, preferably though not necessarily A.M.I.Mech.E. or A.M.I.C.E., required for position with large company in Middle East. Age preferably 30-35. Basic salary according to experience plus free furnished quarters and living allowance. Apply with full details to—Box 1233.

FOREMAN required to work from Rhos, Carmarthenshire. Experience in all branches of overhead line distribution work is essential. Salary £665 per annum inclusive of all overtime. Applications stating age, experience, present position and wage to be sent to Mr. W. E. Richardson, Sub-Area Manager, South Wales Electricity Board, South Beach Pavilion, Tenby, not later than the 25th November, 1957. 1317

GENERATOR manufacturers require sales engineer, previous sales experience not essential, however, applicants should be capable of discussing generating sets up to 750 kVA. Residence in London area preferred. Confidential application with full details and salary required to—Box 1079.

HIGH-voltage plumber-jointers and mates, experienced in jointing all classes of cables up to and including 11 kV, required for contract work in South-East England.—Box 1253.

INSTRUMENT mechanic with good electrical knowledge for the maintenance of industrial meters covering boiler and power plant and paper manufacture.—Bowaters United Kingdom Pulp & Paper Mills Limited, Thames Division, Northfleet, Kent. 1223

JUNIOR electrical engineer/draughtsman. Age 22/25. H.N.C. or O.N.C., experienced in estimating and contract work for mechanical handling plant. Pension fund, sports and canteen facilities. Particulars of experience, qualifications and salary to—W. J. Jenkins & Co., Retford, Notts. 1137

LIGHTING engineer with planning and contact experience required for Manchester office of Ekco-Ensign Electric Ltd. Apply—Manager, Blackett Street, Fairfield Street, Manchester, 12. 339

KODAK Limited have a vacancy for an operational efficiency engineer to carry out daily performance checks on operation of boiler plant, turbo-generators and alternators and refrigeration plant. H.N.C. electrical or mechanical desirable, and previous experience of power station practice essential. Free life insurance, sickness benefit and pension plans in operation. Please write to Men's Personnel Dept., Kodak Ltd., Harrow, Middx., quoting DGD/PH. 1234

LAMP factories in London have vacancies for technicians working with incandescent lamps and filaments. Applicants, aged 18-25 years, with suitable experience or able to undertake further training, should apply to—Atlas Lighting Ltd., Angel Factory Colony Estate, Edmonton, London, N.18, marking envelope LED/WJM. 1275

LONDON consulting engineers require electrical engineers for installation design for hospitals, commercial buildings, schools, etc. Write stating age, qualifications, experience and salary required to—Box 1321.

OVERSEAS appointments. The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2, has vacancies for a few young men for training for positions overseas as sales engineers with the company or its agents. Sound engineering background essential, with H.N.C. or equivalent qualifications desirable. Commercial training for 12-18 months' duration will be given prior to posting abroad. Apply giving full details of age, training, etc., to Staff Manager (Ref. O.A.). 1254

QUALIFIED electrical engineer required for hydro-electric power undertaking in Northern Nigeria, 4,000 feet above sea level, pleasant climate. Comfortable furnished quarters provided, first class passages for self, wife and two children or equivalent benefits if children remain at home. Good salary and pension scheme with liberal leave after 18 months' tour. Write, stating age, full qualifications and experience, to—Box Z.264, c/o Streets, 110, Old Broad Street, London, E.C.2. 1106

QUALIFIED engineer or engineering designer/draughtsman required to be trained as assistant chief draughtsman in a neon sign and light engineering factory. When replying, please give details of qualifications, experience, age and salary required to—Claude-General Neon Lights Ltd., Wembley Hill Estate, Wembley. 1255

REPRESENTATIVES required, already calling upon architects, factories, local authorities, electrical trade, etc., to sell electric clock systems on a commission basis. Write stating area covered, age and experience to—Box 1235.

REPRESENTATIVES required for all areas, with established connections with leading retailers and stores in the electrical domestic appliance trade, to market a range of nationally advertised electrical domestic appliances. Own car essential. Salary, expenses and commission. Only men possessing initiative, drive and ambition for promotion, and aiming to earn from £1,500 p.a. upwards, need apply to—Box 1025.

SALES manager required by firm of electrical and mechanical engineers manufacturing a wide range of special products. Full particulars, including age, experience and salary required, to—Browning's Electric Co. Ltd., Boleyn Castle, Green Street, Upton Park, London, E.13. 1159

SALES representative for S. Yorks and E. Lancs, etc., preferably already domiciled in triangle Leeds-Sheffield-Manchester. Electrically qualified and experienced to promote the sales of "Ashley" electric wiring accessories and, for associated company, "Astral" industrial switchgear and L.T. distribution equipment. Salary, commission, contributory pension, expenses, car and hard work provided. Health certificate required. Informative letters and photograph to Sales Director, Ashley Accessories Ltd., Ulverston, Lancs. Confidential consideration assured. 1311

SENIOR sales engineer to operate from London office of leading manufacturer of rotating electrical machinery. Highest technical and commercial qualifications are required. Prospects of promotion to branch manager for suitable applicant. Pension scheme and car provided. Reply in confidence stating age, experience, qualifications and salary required.—Box 1107.

TRADE counter/stock records assistant for London electrical wholesalers.—Batt Electrical, 6, Dock Street, London, E.1. 1318

SMALL electronics factory near Bromley (Kent) requires foreman to supervise wiring and machine shop. Must have O.N.C. or equivalent. Experience of electronic prototype work an advantage. Wage £13/£15 depending on experience.—Box 1310.

SWITCHGEAR engineer-designer required for M.V. and H.V. air and oil break switchgear. Works situated 20 miles N.W. London. Good prospects. Salary commensurate with technical qualifications and ability. Housing assistance. Applications, marked "Confidential," stating age, experience, etc., to—Chief Engineer, J. G. Statter & Co. Ltd., Amersham, Bucks. 1224

SWITCHGEAR erection supervisor required for South-Eastern area based on London. Must be skilled fitter with experience in erecting and commissioning 33-kV and 11-kV switchgear and control boards on site. Applications stating experience and wage required to—South Wales Switchgear Ltd., 19, Woburn Place, London, W.C.1. 1256

TECHNICAL representative required by pump manufacturer's agent operating Midland Counties. Knowledge of pump applications desirable, but personality and integrity essential. Birmingham office. Car provided. Salary, commission and expenses paid. Apply by letter stating age, qualifications, experience, salary required, whether married, and if you hold a driving licence.—Box 9194.

TRANSFORMER designer/draughtsman, experienced with units up to 250 kVA. Salary commensurate with experience. Bonus and free housing accommodation to suitable applicant.—Stewart Transformers Ltd., 75, Kilburn Lane, London, W.10. 1312

WANTED for electrical consultant's dept. of large firm of architects in Bloomsbury (a) junior electrical engineer; (b) young electrical draughtsman, for installation schemes in large buildings. Apply, giving full details of education, training and salary required, to—Box 1313.

WELL-known cable manufacturer (C.M.A.) requires sales representative for the London area. Applicants should be between 25-40 years, preferably with established connection. The position offers good prospects for advancement and applicants should write in confidence to—Box 1206.

WINDING shop departmental foreman required by large firm in Eastern England manufacturing wide range of A.C. and D.C. rotating machinery. Applicant should have experience of modern H.T. and L.T. winding methods. Good salary, bonus and pension fund, and assistance in housing, to man with experience seeking interesting and progressive post. Applications will be treated in strict confidence.—Box 1236.

YOUNG electrical engineer required for training as assistant designer on special motors and other electrical equipment. Full particulars, including age, technical qualifications and salary required, to—Browning's Electric Co. Ltd., Boleyn Castle, Green Street, Upton Park, London, E.13. 1157

YOUNG man, completed National Service, required for illuminating engineering dept. in London. Should be well educated and some technical knowledge preferred. Apply—Senior Lighting Engineer, Ekco-Ensign Electric Ltd., 45, Essex Street, London, W.C.2. 348

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A MAINTENANCE engineer available Dec. General industrial and specialised plants. Capable of designing and estimating improvements, and new installations.—Box 9201.

A PUBLIC school man aged 30 seeks administrative position. 10 years' experience with leading electrical manufacturers, covering market research, sales promotion and selling abroad. Specialised knowledge of electrical consumers' requirements in European and African markets. Fluent French.—Box 276.

ELECT. eng., middle thirties, qualified, seeks permanent position with company, preferably in South. Experience factory maintenance, installations, consulting. Please state salary range.—Box 9193.

ADVERTISER, 10 years managerial/resident engineer capacity, controlling major electrification contracts, o/h lines, etc., home and overseas, desires similar or allied appointment. Currently assistant to managing director substantial manufacturing company, machining, tooling, steel fabrications. Age 38. Experienced general management, including budgetary control and costing, company finance.—Box 9182.

REPRESENTATIVE, 29, resident London, fully experienced in electrical material and trade procedure, seeks better position.—Box 9200.

TRAVELLER with London wholesaler, C.M.A, etc., seeks change. Turnover £35,000 p.a., mainly West London and western outskirts.—Box 9195.

YOUNG R.E.M.E. officer, Grad. I.E.E., 8 years' experience in supply industry, seeks appointment in private firm, home or overseas.—Box 9192.

ARTICLES FOR SALE

CENTRAL ELECTRICITY AUTHORITY

London Division

OFFERS are invited for the purchase, dismantling and removal of the following Turbo-Alternator from Acton Lane Generating Station:—

1 C. A. PARSONS Turbo-Alternator, year 1940, 3 MW, 3,000 r.p.m. Generating at 3-phase, 50 cycles, 3,300 volts. Turbine, impulse reaction type, 275 lb. per sq. inch. Steam temperature 750° F.

This unit is serviceable and is complete with equipment.

Application for permission to view and conditions of tender, should be made to the Divisional Purchasing Officer, Central Electricity Authority, London Division, Generation House, Great Portland Street, London, W.1, not later than the 29th November, 1957. 1320

GENERATING PLANT

ONE unused 310-kW Motor Generator Set by BRUCE PEEBLES, input 440/3/50; output at 105 volts D.C., 740 r.p.m., with control gear; Admiralty Class II specification.

THREE unused 60-kW Motor Generator Sets by G.E. (U.S.A.), input 440/3/50; output at 110 volts D.C., 1,450 r.p.m.

QUANTITY of unused 30-kW, 225-volt D.C., 1,100-r.p.m. MAWDSLEY and HARLAND Generators, Admiralty Class II specification.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241) 207

T. W. W.

FOURTEEN 72.5-kW Diesel Alternating Sets comprising 100-b.h.p. A.E.C. stationary 6-cyl. oil engines, 1,500 r.p.m., flexibly coupled to protected type G.E.C. alternators, 415 v., 3-phase, 50 c/s, 0.9 p.f., arranged for battery starting, complete with switchboards, including Isenthal automatic voltage regulation and synchronising gear for phasing into mains supply.

THOS. W. WARD LTD.
Brettenham House, London, W.C.2
(Temple Bar 1515, 12 lines) 1265

AUTOMATIC VOLTAGE REGULATORS FOR IMMEDIATE DELIVERY

500 unused TONUM A.V.R.s to control 230/400-v. alternators; maximum exciter field current 8 amps.; maximum pile resistance 40 ohms.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241) 1257

COMPRESSOR SETS FOR SALE

MODERN UNUSED 12-c.f.m., 200-p.s.i. w.p., fully automatic, receiver-mounted Compressor Sets by CURTIS / BROOK MOTORS.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241). 1177

***Articles for Sale** (continued)*

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.
ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

B.E.V. elect. bat. Forklift, 2-ton cap., 9-ft. lift, complete with bat. charger, guaranteed. View — Burleigh, Alpine Wks., Empire Way, Wembley (Phone 0211). 878

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, second-hand and new up to 30 h.p. Starters, slide rails and pulleys. Ring Mon. 3355 for your requirements. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (Ealing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CHAMBERLAIN & Hookham six-stage power factor correction condenser relay, type B.P.F., complete with C.T. 1,000/5, 40 VA. for use on 400-volt, 3-phase, 50-cycle supply. —Whitefield Machinery & Plant Ltd., Cobden Street, Salford, 6 (Tel. Pen. 4746). 1051

CIRCUIT breakers, various sizes in stock. A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, 110 and 220 v. D.C./230 v. A.C., .5 to 6 kVA; also A.C./D.C. Special voltages at short notice.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELEC. lamps, new surplus, best-known makes, 15, 25, 40 w., 200, 220, 230, 240 v., BC & ES, at 9d.; 60 w., 110 v. at 9d. Numerous special voltages up to 2,000 w. Torch bulbs, 3.5 v., Osram, 12s. per 100, all tax inclusive. Auto bulbs from 4d. Miniature bulbs from 1.5 to 50 v. Mercury discharge, sodium, miniature fluorescent lamps, chokes, transformers, etc. Lists on request. — Suplex Lamps Ltd., 239, High Holborn, London, W.C.1 (HOLborn 0225 and 4543). 347

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines): also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues. — The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR sale: Two generator sets comprising D.C. generators, exciters, driving motors, A.C. motor control gear, D.C. switchboards, generator panels and exciter panels. Condition as new. For further information and best offers write—Box 1267.

G.E.C. slipring motor, 10/5 h.p., 1,440/720 r.p.m., 520 volts, 50 cycles, 3-phase. Offers to—John Sherratt & Son, Park Road, Altrincham. 1268

GENERATING plants, remote and M/F up to 10 kVA; also secondhand A.C. and D.C. sets up to 100 kVA, large stock all types. Special plants built at short notice.—Powerco Ltd., 312, York Road, London, S.W.18 (Tel. VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW. A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 161

HEAVY twin core cab tyre flex, 248/.018, by J. & P., carries 100 amps. Several hundred yards on drums, unused. Cheap. View—Burleigh, Alpine Works, Empire Way, Wembley (Phone 0211). 906

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., s.-ph., 50 c., 2½ amps., 7s. 6d. each, 1s. 6d. postage; 5 amps., 17s. 6d. — Universal Electrical, 217-221, City Road, London, E.C.1. 37

LANSING Bagnall 2-ton elect. bat. powered pallet trucks, pedest. control, model PP, with chargers; 4 for sale. View—Burleigh, Alpine Wks., Empire Way, Wembley (Phone 0211). 879

LISTER 2½-kW, 230-v. Startomatic generator plant, can be seen running near Guildford. £150. O.N.O.—B. & S. Electrical Contractors, 1, Bridge Street, Guildford. 1258

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS, starters, circuit-breakers. Huge stocks of all types, ¼ to 300 h.p. Stock list or quote by return.—J. S. Ramsbottom & Co. Ltd., Bow St., Keighley (3774-5-6). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each subject. — F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes: enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

TWO Hackbridge-Hewittic transformer-mercury arc rectifier sets, with main switches. Input 400/440 v. A.C., 50 cycles, 3-phase; output 220 v. D.C. 80 kW and 20 kW. Both sets in excellent condition. Offers to — The Bursar, Downside Abbey, Stratton-on-Fosse, Bath. 1270

VARIOUS winding wires, D.C.C., Rayon and Lewmex, medium and fine s.w.g. Surplus to requirements.—Rotary Electrical Co. Limited, 40, Spring Street, Sheffield, 3. 1277

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generator sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

1,000 dozen U.2 type non-leak batteries, with guaranteed shelf-life 4 months. Immediate delivery.—Aubrey Green Ltd., 79, High Street, Stoke Newington, London, N.16 (CLIssold 1183). 1314

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return. — Whitetrade Limited, Rochester, Kent (Tel. Chatham 4638/9). 294

ARTICLES WANTED

WANTED: STATIONARY DIESEL-DRIVEN ALTERNATOR SETS

Specification :—

(1) Size either 300 kVA minimum, 500 kVA maximum—optimum 400 kVA on 415 volts, 3-phase, 50 cycles, or 400 kVA minimum, 600 kVA maximum—optimum 500 kVA on 440 v., 3-phase, 60 cycles.

(2) DRIVE—DIESEL ENGINE, preferably high speed to give reasonable speed variation.

(3) Excitation—separate motor generator exciter set or close coupled exciter controlled by motor-operated rheostat.

(4) Voltage range—preferably 150 volts, 600 volts, with control by exciter field. But higher minimum voltage might be acceptable.

(5) Frequency range, 40 cycles — 65 cycles would be preferable.

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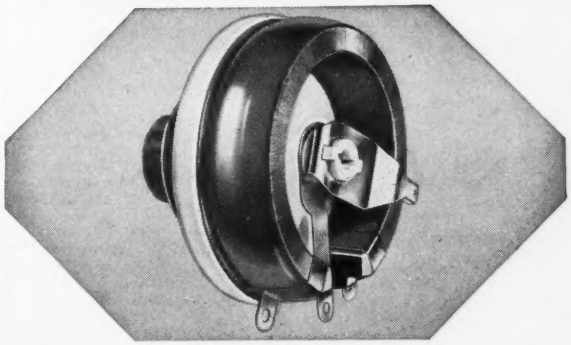

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COMPANY MEETINGS

CAMP BIRD LIMITED

A Great Advance

Mr. John Dalgleish's Review

THE 55th Annual General Meeting of Camp Bird Ltd. was held on 8th November in London, Mr. John Dalgleish, Chairman, presiding.

The following are extracts from his statement circulated with the report and accounts for the period from 1st January, 1956, to 30th April, 1957 :—

During the 16 months ended 30th April, 1957, Camp Bird made a tremendous physical advance. Little more than an investment company at the beginning of 1956, the period ended with 44 companies under our control. A complete management organisation was created and new headquarters secured.

More than two-thirds of our investments were re-deployed during the period, yet acquisitions were so timed that earned income increased to a new record annual rate, despite the fact that no dividend income was received from our new subsidiaries. Our growth has accelerated during the present year, and increasing profits are arising in all our new fields of activity.

Earnings and Dividends

Consolidated earnings for the 16 months total £657,856, of which £108,077 was contributed by subsidiary training companies " since acquisition " by Camp Bird.

If we had had a trading profit from our subsidiaries for the full 16 months' period we should have felt justified in paying a final dividend of 6⅔% in respect of the period to 30th April, 1957, to maintain our 20% record. This not being the case, we have decided to recompense shareholders by paying a first interim dividend of 6⅔% for the period ending 30th April, 1958. Consideration will be given to the payment of a second interim dividend when the results for the half year to 31st October, 1957, are available.

It is of more than passing interest that had we simply retained the portfolio the present Board inherited in 1955 it would to-day be worth no more than £1,250,000, and earned income would have remained around £100,000 a year.

Income Sources

You will note in the parent company Profit and Loss Account that we have divided income into four main parts :—

1. Profits from realisation of investments and sundry income.
2. Dividends received.
3. Profits from purchases and sales of businesses.
4. Management fees.

A large part of our Group expenses is now devoted to investigating the buying and selling of properties of various descriptions.

The success of these new activities is shown by the fact that, in the present accounts, the total cost of running your company was recouped by this division, and already in the current year our total annual running expenses may well have been more than recouped by these activities.

Management fees total only £35,000 in the appended accounts. In a full year, however, such fees are expected to be more than £100,000 and, the more profitable our subsidiary companies become, the greater will be the management income by the parent company. This, too, must be regarded as a permanent—and I hope expanding—source of income to us.

Industrial Complex

Your Directors have carried out their intention to maintain a rough equality between gold share, base metal mining and industrial investment. And it is now possible to see the shape of the industrial group we have built up in the past few months.

Camp Bird now controls an industrial complex which begins with research and development, moves through industrial production, and has an appendage of retail distribution, almost exclusively in the electrical and electronic fields.

This Group is rapidly developing into one of the largest and most self-sufficient groups in the British electrical and electronics industry.

Cold Forging Limited.—We have just finished the first public exhibition of our steel cold forging presses at Hanover, in conjunction with our colleagues, International Cold Forging Corporation. Our installation was unquestionably the sensation of the Fair, and enquiries involving more than £1,000,000 of business were being progressed as this review was compiled.

It is now beyond question that we have in our cold forging process one of the most momentous developments that has ever confronted the steel industry. Further cold forging presses are now being built at our Hanworth Engineering factory, and you may look forward to considerable financial profit from this enterprise in due course.

Hampton & Sons Limited.—It may now be said that Camp Bird will have recovered its total original investment in Hamptons by the end of the present financial year, and we still own a retail and contracting organisation with a turnover rapidly increasing beyond £1,000,000 a year. The malaise which led to tremendous losses in the past three years has been arrested and the reorganised business is now going ahead.

In this connection, Camp Bird has this month acquired the whole equity of another famous furniture manufacturing concern, H. Morris & Company Limited, of Glasgow. Together with the Hampton furniture contract organisation, this will make the largest and most efficient group of furniture contractors in Britain, and almost certainly in the world.

Hartley Baird Group.—You will no doubt have seen that Hartley Baird had a bad sixteen months, ending with a loss of £75,000. This emerging position was known to the Camp Bird directors when they agreed to acquire control of the company. Our inspection revealed that the basic technical and management quality of the company was good and that a more concrete direction could change the face of affairs.

This has turned out to be right. The company is now earning profits, following some deep incisions into the original composition of the group, whereby the dead wood was cut away. There is every reason to believe this company will become a profitable member of the Camp Bird industrial group.

Creston Electric Limited. — This company was withdrawn from the Hartley Baird Group and placed under the direct control of Camp Bird Industries Limited. Losses which had reached £113,000 in the sixteen months under review were largely terminated by the closure of the Oldham plant.

Manufacturing of automatic vending machines for Coolers & Venders Limited (the latter recently, also, having come under control of Camp Bird) by Creston has been temporarily sub-contracted to Hartley Electromotives Limited, pending a reorganisation of the Creston situation.

Creston is now re-entering production and there are considerable tax losses in this company which will be available against future profits. We have, meanwhile, reserved £100,000 against the shortfall in Creston assets at the time of the balance sheet.

Tenaplas Limited.—This company, also, was formerly a member of the Hartley Baird Group. In the sixteen months, losses reached the level of £59,000. Since reorganisation as a direct subsidiary of Camp Bird, I am glad to report these losses have been stopped and a reasonable future can be seen for the company.

Considerable re-equipping with the most modern extrusion plant is now under way and there are encouraging signs of a re-expanding market for extruded plastics.

Hanworth Engineering (Aircraft) Limited.—This company is well known as high-precision engineers. It is expected to expand as a central toolroom for the whole Camp Bird Industrial Group, in addition to carrying on its normal outside contractual work. Plant at this factory is under continuous modernisation to keep the quality of work at the highest possible level.

Limit Engineering Group Limited.—This company continues as a profitable leader in the field of small electric motors and fans. Limit have more " firsts " in this field of industry than any other electrical engineering company extant. Their latest development—the first truly efficient baby D.C. motor for use in battery-operated record players—will open up massive and entirely new markets for portable record players, for which there has been such an insistent unsatisfied world-wide demand in recent years.

Limit engineers are also busy with other new motor developments of considerable importance, and a large planned expansion in the general operations of the company is under way.

J. Langham Thompson Group Limited.—Order books for this group extend to four and five years in many development departments. The commercial side of the concern is also developing quickly. The Group has established a new record profit in each of the 11 years since the first companies were formed.

The growth is expected to accelerate in the current year. All departments are expanding and a large new central research and development centre is now under construction near Watford.

Coolers and Venders Limited.—This company is the selling and licensing organisation for a number of leading American automatic vending machines. Camp Bird acquired a controlling interest during the summer, so that a single direction could operate manufacturing (now done by the Hartley Baird Group) and the selling and financing of sales.

The demand for these automatic vending machines (dispensing such things as tea, coffee, soft drinks, hot and cold food and miscellaneous items such as magazines) is expanding rapidly in Britain and we consider only the fringe of the potential market is yet being touched.

Target

While it is too early to be dogmatic about trading results for the overall industrial group during the present year, we are targeting for not less than £500,000 net profits before tax.

In the sixteen months under review the turnover of the industrial group was at the annual rate of just under £5,000,000.

New capital expenditure within the existing industrial group is unlikely to exceed £200,000 for the current year—all of which we propose to finance from existing resources.

Mining Affairs

Next, I wish to draw your attention to developments at the Camp Bird Mine in Colorado. It is now clear that we have located in our Colorado property, in the Yellow Rose vein, an orebody which in the few months at our disposal has already produced estimated indiciated ore reserves of some 260,000 tons having a combined metal value of $29.78 per ton at to-day's metal prices.

Legislation is expected soon in the States which will protect the prices of lead and zinc well above the figures at which these metals are included in our present ore reserves. We consider it wise to wait for this legislation before proceeding to full scale operations. There remains now mainly the installation of the necessary mill to commence operations. This mill is estimated to cost between $800,000 and $1,000,000.

In miscellaneous mining matters, I am glad to say that Tekka-Taiping, our tin property in Malaya, continues to do well, and good profits are likely to be earned until the end of the present financial year at least. It will be appreciated that this is a dying property, but steps are being taken to ensure that the eventual closing down will not be unprofitable.

We have acquired a 7½% interest in rights which may arise from the investigation taking place in the area east of Stilfontein and Buffelsfontein, known as the Pochefstroom area.

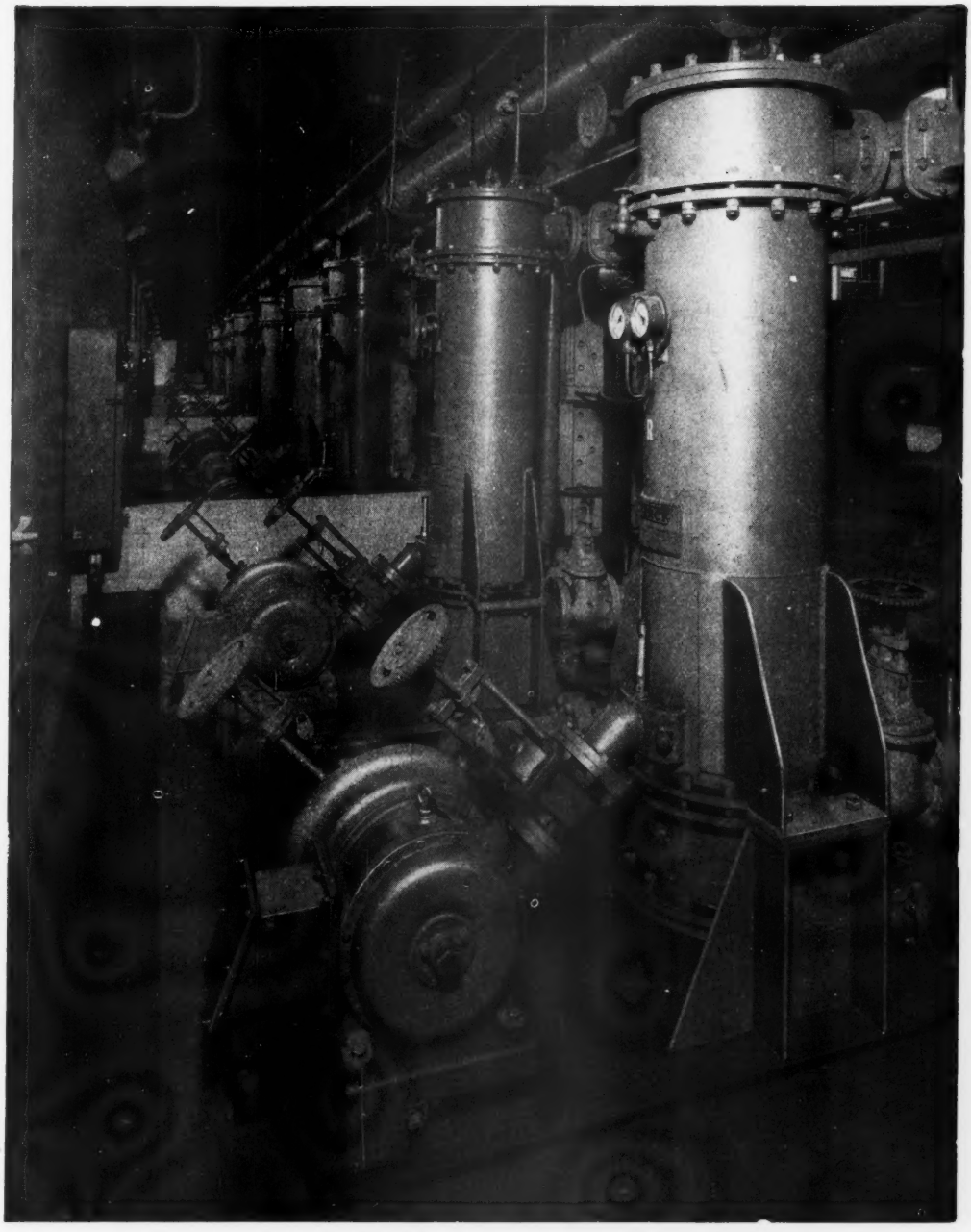
We have been invited to participate in a major aerial survey of potentially mineralised areas in Canada, and this matter is currently being raised with the British Treasury to ensure an adequate supply of hard currency so that we may play our part.

Inflation—Deflation

Recent excitement in the currency field underlines our wisdom in retaining a strong portfolio of gold shares, which will be major beneficiaries of any series of currency devaluations. Any intervening " paper " losses may be borne with equanimity.

We have a high income from our gold shares, and we are creating an integrated industrial organisation in those fields which we believe will suffer least (and indeed may prosper further) in the event of a deflation.

The report was adopted. 1238



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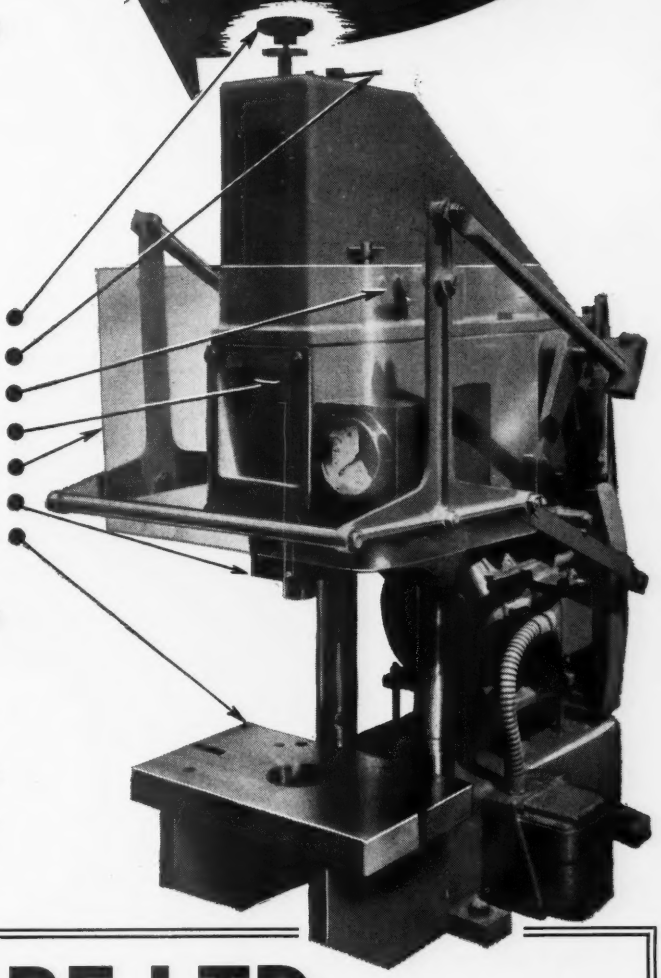

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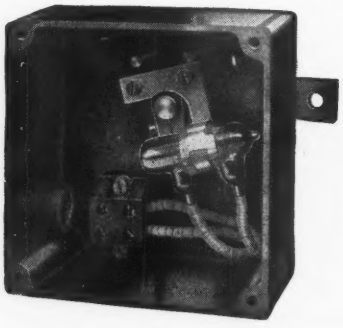

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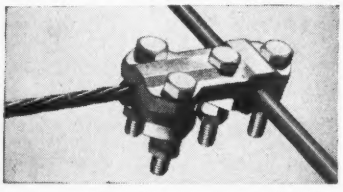

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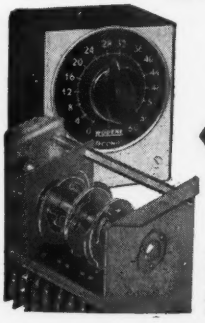

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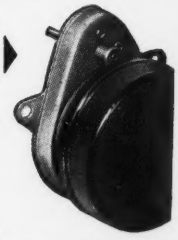

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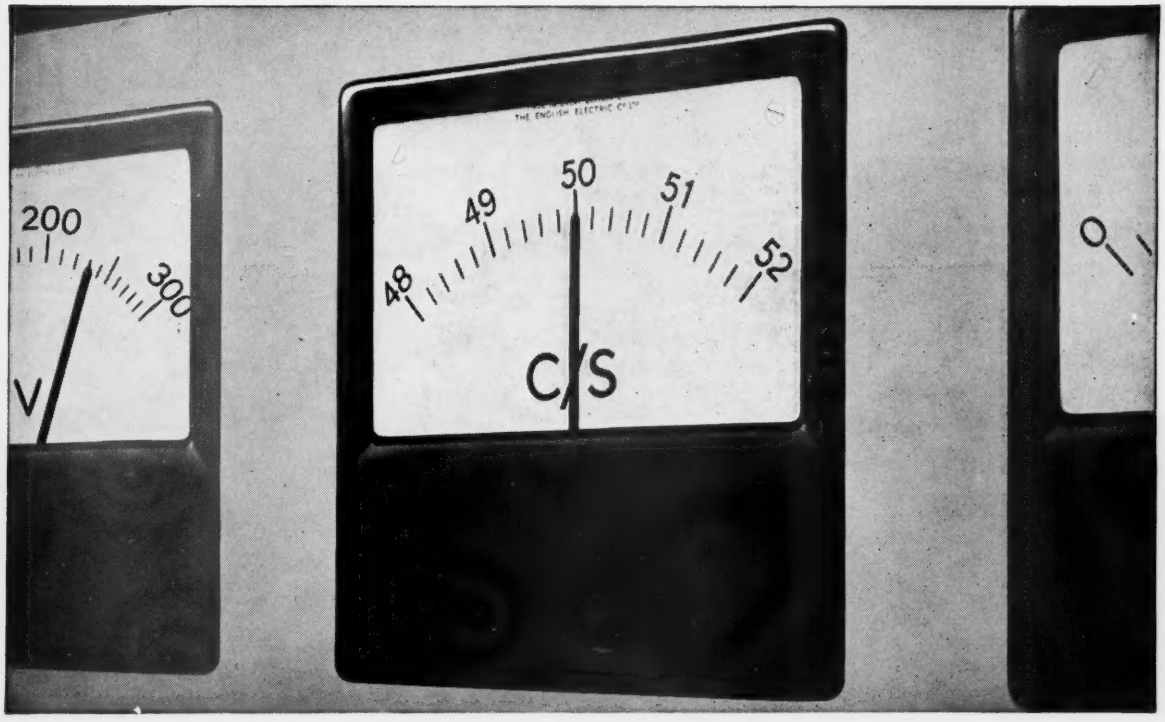

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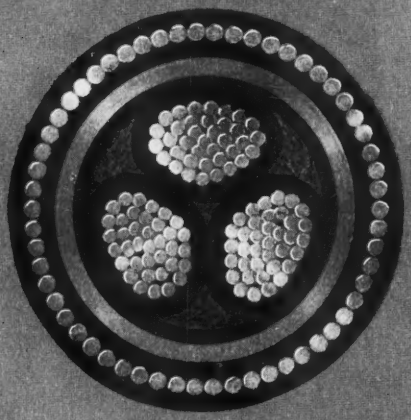

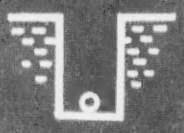

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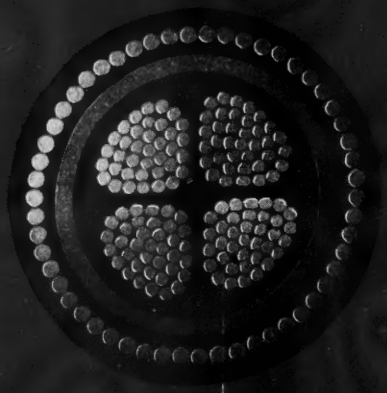

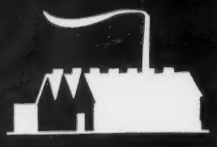

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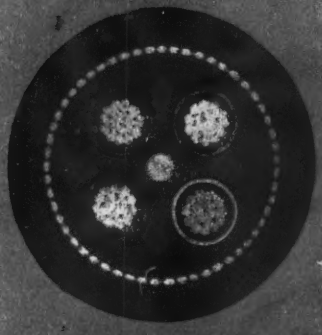

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